

DEVELOPMENT, IMPLEMENTATION AND EVALUATION OF AN ONLINE
NUTRITION EDUCATION PROGRAM FOR SOUTH ASIANS IN THE U.S.

A Dissertation

by

ZUBAIDA QAMAR

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	William Alex McIntosh
Co-Chair of Committee,	Yenory Hernandez-Garbanzo
Committee Members,	Jenna Anding
	Edward Murguia
Head of Department,	Boon Chew

December 2016

Major Subject: Nutrition

Copyright 2016 Zubaida Qamar

ABSTRACT

South Asians have an increased risk of diabetes and cardiovascular diseases in comparison to other ethnic populations in the U.S. To prevent and mitigate the consequences of these conditions, culturally appropriate, theory-based programs are needed which have a focus on nutrition education, health promotion and disease prevention. The objective of this study was to develop, implement and evaluate an online nutrition education program for South Asian adults in the U.S. and to determine any post-intervention changes in the behavior and its mediators. Needs assessment was conducted to determine the nutrition and health related concerns in this population and to inform the outline of the program. This program followed the DESIGN procedure and was guided by the Theory of Planned Behavior (TPB). The focus was on disease prevention aspects e.g. consumption of fruits and vegetables, label reading, weight management and physical activity. The surveys measured the demographics, dietary and health behaviors, and TPB constructs (attitudes, social norms and perceived behavioral control) related to the behaviors.

South Asian participants (n=166) completed the pre-test survey, out of which 66 enrolled in the program. Statistical analysis included descriptive statistics, and independent t-tests that determined the differences between pre- and post-test factors. Additionally, linear regression was conducted to determine the relationships among behavioral elements, TPB constructs, and sociodemographic factors. Results show the mean age of participants was 27.4 ± 7.4 years. Significant ($p < 0.05$) post-test differences

were improved healthy eating strategies score, reduced fast food consumption, and increased confidence towards fruit and vegetable intake after the program. The participants (92%) agreed or strongly agreed that the program was overall helpful and facilitated in increasing their awareness about healthy eating, physical activity and weight management. Regarding the mediators of behavior change, only intention to consume fruits and vegetables was significantly associated with increased fruit intake. However, no significant association was found with vegetable intake. In conclusion, results from this study suggest that a theory-based, online program improved some factors associated with healthy dietary behaviors in South Asians in the U.S. Future large scale studies are needed to determine the effect of such interventions on the South Asian population.

DEDICATION

I would like to dedicate this work to my beloved mother and father for all their hard work, support, encouragement, love and care.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. McIntosh, and my committee members, Dr. Hernandez-Garbanzo, Dr. Anding, and Dr. Murguia, for their guidance and support throughout the course of this research. In particular, I would like to thank Dr. McIntosh for always supporting my academic and career goals as well as always being available for answering any questions. Special thanks to Dr. Hernandez-Garbanzo for guiding me towards the submission of my first accepted abstract to a conference and for leading me towards the remarkable work of Dr. Isobel Contento in the field of nutrition education whose DESIGN model served as a foundation for this project. A big thanks to Dr. Anding for directing me towards the validated surveys that I was able to utilize in my project and to Dr. Murguia for challenging me on the latest dietary trends and informing me about the racial issues in the health field.

Thanks also goes to my friends, colleagues, the department faculty and staff for making my time at Texas A&M University a great experience. Also, I am grateful to have an understanding supervisor like Dr. Mian Riaz with whom I worked for years and enjoyed all aspects of teaching. Finally, I would like to express my immense gratitude to be blessed with such wonderful parents and family members who have always offered encouragement, support, love and care in all aspects of life.

CONTRIBUTORS AND FUNDING SOURCES

This work was supervised by a dissertation committee consisting of Dr. William Alex McIntosh (chair), and Dr. Jenna Anding of the Nutrition and Food Science Department, Dr. Yenory Hernandez-Garbanzo (co-chair) from Food and Agriculture Organization of United Nations, Italy and Dr. Edward Murguia of the Department of Sociology. All work for the dissertation was completed independently by the student without outside financial support.

NOMENCLATURE

BMI	Body Mass Index
CVD	Cardiovascular Disease
F/V	Fruits and Vegetables
IRB	Institutional Review Board
HE	Healthy Eating
HEI	Healthy Eating Index
PA	Physical Activity
SA	South Asians
TPB	Theory of Planned Behavior
U.S.	United States of America

TABLE OF CONTENTS

	Page
ABSTRACT	ii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
CONTRIBUTORS AND FUNDING SOURCES.....	vi
NOMENCLATURE.....	vii
TABLE OF CONTENTS	viii
LIST OF TABLES	x
CHAPTER I INTRODUCTION.....	1
Problem/Research Purpose.....	2
South Asian Diet	5
Nutrition Education	8
Web-Based Nutrition Education	11
Purpose of the Study	12
Research Questions	13
CHAPTER II LITERATURE REVIEW.....	14
Diet Quality of South Asians in the U.S.	14
South Asian Paradox	15
Concept of Health in South Asians	16
South Asian Heart and Lifestyle Intervention (SAHELI).....	16
Multimedia Interventions	17
Nutrition Education Research in South Asians	18
Importance of Pilot Studies	18
CHAPTER III METHODS.....	20
Sample Size	20
Recruitment	21

	Page
Design of the Nutrition Education Program	22
Lesson Plans	23
Survey Instrument	25
Statistical Analysis	26
 CHAPTER IV RESULTS.....	 28
Demographics.....	28
Fruit and Vegetable Intake	30
Water and Beverage Intake	32
Health Status	32
Weight Status	33
Attitudes and Opinions about Fruit and Vegetable Consumption.....	34
Healthy Eating Strategies	35
Confidence Choosing Fruits and Vegetables	38
Fruit and Vegetable Shopping Practices	39
Factor Analysis.....	40
Regression Analysis	43
Evaluation Results.....	47
Recommendations/Suggestions for the Program	49
Post-test Results	50
 CHAPTER V DISCUSSION	 53
Limitations	61
Strengths	62
 CHAPTER VI SUMMARY AND CONCLUSIONS.....	 63
Summary	63
Conclusions	64
 REFERENCES	 66
 APPENDIX A SURVEY INSTRUMENT	 76
 APPENDIX B LESSON PLANS.....	 94

LIST OF TABLES

		Page
Table 1	Demographics of the Participants	29
Table 2	Educational Background	30
Table 3	Vegetable and Fruit Intake for South Asians (pre-intervention).....	31
Table 4	Water and Beverage Intake (pre-intervention).....	32
Table 5	Perceived Health Status of the Participants (pre-intervention)	33
Table 6	Description of Weight Status (pre-intervention).....	34
Table 7	Attitudes towards Fruit and Vegetable Consumption (pre-intervention)..	35
Table 8	Healthy Eating Strategies (pre-intervention).....	37
Table 9	Confidence in Consuming Fruits and Vegetables (pre-intervention).....	39
Table 10	Fruit and Vegetable Shopping Practices (pre-intervention).....	40
Table 11	Intake of Vegetables Regressed on Attitudes & Behaviors towards Eating Vegetables (pre-intervention).....	44
Table 12	Intake of Vegetables Regressed on Control Variables and Other Health Related Factors (pre-intervention)	45
Table 13	Intake of Fruit Regressed on Attitudes and Behaviors towards Eating Fruits and Vegetables (pre-intervention).....	46
Table 14	Intake of Fruits Regressed on Control Variables and Other Health Related Factors (pre-intervention).....	47
Table 15	Evaluation of the Program.....	48
Table 16	Intentions Related to Health Behaviors.....	49
Table 17	Pre- & Post-Program Comparison in Behaviors & Constructs of TPB	52

CHAPTER I

INTRODUCTION

South Asians represent about a quarter of the world's population and are one of the most rapidly growing immigrant populations in the United States (Lagisetty et al., 2016). South Asians, in particular, also represent the minority group which is growing second fastest in the U.S. (Khan et al., 2016). According to the U.S. Census Bureau, there are more than 3.4 million South Asians in the U.S. based on 2010 census data (U.S. Census Bureau, 2012). The majority of South Asians have settled in the metropolitan areas e.g. Houston, Dallas, Chicago, New York city, San Francisco Bay Area, etc. (Kittler and Sucher, 2004). South Asia, or the Indian subcontinent, as the region is often referred to, consists of the following countries: India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Bhutan (Sharma, 2006). South Asian individuals have been shown to possess diverse ethnic identity, referred to as differentiation, in comparison to individuals from Far Eastern (e.g., Japan, China etc.) and South East Asian (e.g. Malaysia, Thailand, Singapore etc.) countries in the literature (Bhopal et al., 1999, and Misra, 2007). There is substantial heterogeneity among South Asians in terms of religion and languages, but there are numerous similarities in the culture and food that the regional people share allowing for this group to be considered homogenous for purposes of health programming (Ahmed and Lemkau, 2000). However, there is a lack of studies on South Asians in the U.S. that have estimated the effectiveness of nutrition education programs

and examined culturally-relevant determinants of health, nutrition and health promotion interventions (Sharma, 2006).

The need for nutrition education and health programs is of critical importance as Asian Americans are the fastest growing racial/ethnic group in the U.S. with a population of 14 million in 2010 and is expected to rise around 38 million by 2050 (Holland and Palaniappan, 2012). Along with the growing population, this group has its unique set of disease concerns that are specific to the Asian sub-groups. However, it is to be kept in mind that health data has traditionally lumped all Asians in one sub-group where substantial heterogeneity exists among Asian Americans. One of the suggestions given by Holland and Palaniappan is to gather and describe the data in terms of specific Asian-American subgroups (Holland and Palaniappan, 2012). This current project is an attempt to narrow the gap that exists and data is particularly reported for Asians from the Indian sub-continent.

Problem/Research Purpose

South Asians have greater prevalence of cardiovascular diseases (CVD) and type II diabetes in comparison to other ethnic/racial groups (Kanaya et al., 2014, Tillin et al., 2013, and Hajra et al., 2013). A biological comparison study by Shah et al. described that South Asians had higher intermuscular fat and less lean mass than other groups which included Whites, Chinese Americans, African Americans and Latinos. They also had reduced adiponectin levels in comparison to most ethnic groups. Adiponectin is a unique fat-cell specific protein and lower levels of adiponectin are found to be associated

with insulin resistance and type II diabetes (Lihn et al., 2005). These factors combined may constitute to an overall less favorable body composition in South Asians (Shah et al., 2016).

Studies have shown that immigrants of Asian Indian origin have a significantly higher risk of CVD with heart disease rates estimated to be 1.5 to 4 times greater than Whites (Bhopal et al., 1999). Along with a high genetic predisposition of developing CVD and type II diabetes, risk factors such as abnormal lipid levels, increased abdominal fat, diets high in fat (particularly saturated and trans fat), simple carbohydrates and sedentary lifestyles play a significant part in the development of chronic diseases among this population (Misra, 2010). Studies have also demonstrated that South Asians engage in less physical activity than the general population (Fischbacher et al., 2004). Higher prevalence of diabetes and other diseases also includes cultural, socioeconomic, behavioral, and genetic factors (Shah and Kanaya, 2014).

Duration of residence in the U.S. is also associated with risk factors for CVD for South Asian immigrants with <15 years of duration of residence in the U.S. being significantly related to overweight/obese Body Mass Index, daily intake of 5+ servings of fruits and vegetables, and sedentary lifestyle in comparison to $15 \geq$ years of duration of stay for this group of individuals (Bharmal et al., 2015). Bharmal and colleagues suggest development of culturally tailored interventions for South Asian immigrants that have an emphasis on modifiable health behaviors including improved intake of vegetables and fruits and encouraging physical activity in order to decrease the risk of CVD and obesity (Bharmal et al., 2015). Considering these in mind and the fact that

nutrition plays an important role in the prevention of these diseases, primary interests for nutrition and health programs are modifiable behavioral, cultural, and environmental factors. Some of these modifiable factors can be explained by the psychosocial theories that are used as foundations for various nutrition intervention programs. These theories look at various factors such as attitudes, subjective norms, self-efficacy, intention to act, etc.

Research has shown that a normal Body Mass Index (BMI) is considered important in the prevention and early onset of these diseases (Misra, 2007). According to the National Institute of Health, BMI is an estimate of body fat, and is a good estimate of risk for diseases related to more body fat. There are various categories of BMI which are as follows: normal weight (18.5–24.9), overweight (25.0–29.9) and obese (30.0–39.9). A study by the US Department of Health and Human Services found that BMI is influenced by diet and physical activity and can be used as an indicator of a person's health risk. As a result of the documented high risk of diabetes and cardiovascular disease in South Asians, lower BMI thresholds to determine unhealthy weight are set for Asians compared to Western populations. This standard has been accepted by a number of organizations such as American Diabetes Association and UK National Institute for Health and Care Excellence (Iliodromiti et al., 2016). Overweight and obese categories for South Asian individuals are BMI 23-25 kg/m² and BMI ≥ 25 kg/m² respectively. This is in accordance with the international standards by World Health Organization that the BMI should be lower than 25 kg/m² for this population. South Asians have the highest rates of overweight/obesity (25% among men and 37% among women) in

comparison to other Asian subgroups (Tang et al.,2012). Since South Asians females are more prone to these diseases in comparison to males, the suggested cut off is 23 kg/m² for South Asian women in particular (Misra, 2007). Research has also shown that despite moderate increases in BMI, South Asians tend to have higher levels of total and regional adiposity contributing to disease risk factors (Shah et al., 2012).

South Asian Diet

The U.S. is a diverse country, and is composed of a plethora of immigrants from all corners of the world. Irrespective of how early these individuals arrived in the U.S., they and their coming generations have memories of their country of origin.

Appreciation of this cultural legacy helps to bring people of similar background into ethnic clusters that strengthen the rituals and traditions to preserve a fortune of reminiscences and experiences for their descendants. These customs are frequently shared with members of the society. This cultural communication helps in gaining a better comprehension and appreciation of the growing diversity in the U.S. (McWilliams and Heller, 2003).

The South Asian diet is unique having an all-encompassing influence on people of South Asian descent. Though dietary and cultural differences exist based on religion, region and traditions, the South Asian diet has its own identity which can be easily recognized. In the book, *“You eat what you are: People, Culture and Food Traditions”*, Thelma Barer-Stein, talks about various cuisines, economic status and other cultural aspects that shape these cuisines. In the South Asian cuisine section, the common dietary

habits and patterns of people in the South Asian region are mentioned along with the distinct food items associated with various religious and cultural occasions (Barer-Stein, 1999).

Since the majority of the South Asians in this current study were of Indian or Pakistani descent, it is important to understand the demographics of these respective countries. India is about 80% Hindu, 14% Muslims while rest are minorities which includes Christians, Sikhs, Buddhists and Jains. In comparison, Pakistan has about 80% Muslims while rest of the religions comprise of the remaining numbers (Barer-Stein, 1999). Hence in this sample, Hindu and Muslim dietary practices were respectively expected with Hindu dietary practices associated with vegetarianism and Muslim dietary practices associated with meat consumption. These two types of dietary habits comprised the core part at every meal depending on the availability of the vegetarian and meat based food items.

The book also sheds light on the common dietary practices on South Asian in the Indian sub-continent. Some of the food items like milk and other dairy products such as yogurt, milk desserts and drinks are commonly ingested as part of the vegetarian diets depending on availability. Tea is also regularly consumed which has been introduced by the British in the Indian sub-continent. Depending on the region, rice or wheat (in the form of bread) may be the staple. Basmati rice is generally preferred and it is a type of long-grain rice and cooks with a sweet aroma. Other varieties of rice are also used and each variety is consumed in a distinct manner. Fruits and vegetables are consumed in season and are commonly preserved and eaten as pickles (called achar), condiments and

chutneys. Lentils or pulses (legumes) comprise of another important and commonly eaten category of food and are generally referred to as Dal in the Indian sub-continent. Butter and ghee (clarified butter) are limited by use mostly to the people of higher socioeconomic status in the Indo-Pak region. A distinct factor of South Asian dishes is the use of masala which is a blend of freshly ground seasonings. These dishes are commonly referred to as curries which are a “highly seasoned stew with plenty of sauce” (Barer-Stein, 1999). These features constitute the distinctiveness of the South Asian diet in the Indian subcontinent.

In another book, “*Food around the world, a cultural perspective*”, Margaret McWilliams and Holly Heller discuss various regions and the particular food items associated with those regions and socioeconomic influences that affect the make up of the diet. In the chapter, “India and its neighbors”, they have mentioned what has shaped the diet of the Indian subcontinent. Vegetarianism is widespread not only for religious reasons but also for economic reasons as well. Legumes and cereals are a predominant part of the diet and this goes hand in hand with the agricultural conditions of the region. They are relatively economical and can be stored for extended periods of time without refrigeration (McWilliams and Heller, 2003). These references give an idea about the diets of individuals in the South Asian region. In later sections, the diets of South Asians in the U.S. is discussed for comparison.

Nutrition Education

Nutrition Education has been defined as “any combination of educational strategies accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition-related behaviors conducive to health and well-being and delivered through multiple venues, involving activities at the individual, institutional, community, and policy levels” (Contento, 2011). Nutrition education can be a very important tool in changing the behavior of the target population. Considering all these factors described above, it becomes important to understand how healthy behaviors can be promoted in the South Asian population and the behavioral strategies which may be employed to bring about a change in nutrition behavior. Development and evaluation of health programs through theoretical frameworks is considered vital to determine their effectiveness in improving health (Medical Research Council, 2000). Studies have shown that theory based interventions that affect nutrition behavior may provide a foundation for interpreting factors associated with dietary choices (Poddar et al., 2010).

It is important to recognize the processes and factors impacting behavior in order to create efficient nutrition education interventions that can be applied to achieve meaningful behavioral modifications. This information about factors associated with dietary choices can be gathered by theory-based intervention. A few of the psychosocial theories used to address nutrition education and behavior are social behavior theory, theory of planned behavior, health belief model and the transtheoretical model (stages of change model). Researchers who are interested in predicting individual’s behaviors

based on their attitudes, beliefs and social norms have used these theories extensively. These theories can also be used in combination to address nutrition education concerns in different populations and these combinations have been found to be successful (Neuenschwander et al., 2013). All the different theories have their benefits in delivering an effective nutrition education program, depending on the population. In this study, the focus is on using the theory of planned behavior to develop a web-based nutrition education program in South Asians. A brief description of the main concepts of the Theory of Planned behaviors which will be used in the study and the rationale for using this theory for the program is mentioned below:

Theory of Planned Behavior (TPB): This theory has been widely used to predict health related behaviors. TPB hypothesizes that an individual's particular behaviors are governed by their intentions to implement those behaviors (Ajzen, 1991). In this theory, the assumption is that there is an element of control over the behaviors the individuals perform. This control of behavior or rational choice is further governed by three main factors which form the basis of this theory. These three parts are: 1) attitude (towards behavior), 2) subjective norms and 3) perceived behavioral control. Attitude can be defined as the extent to which a person has positive or negative assessment regarding the particular behavior. Subjective norms are the normative impacts and can be defined as the perceived social pressure to execute the behavior or not. Perceived behavioral control is the individual's perception of the ease or the difficulty of performing the behavior of interest. All these parts can help predict individual's intention for the particular behavior. Intention is the immediate predecessor of behavior but control over the action of the

behavior should be considered also (Fishbein & Ajzen, 2010). A person may consider access to adequate resources, possession of certain skills or availability of opportunities to effect their ability to carry out a certain behavior or in other words, have more control of the behavior (Ajzen,1991).

In order to understand the rationale behind using the theory of planned behavior, it is important to have a look at some of the studies that have used this theory in regards to eating habits in different populations. A systematic review done by Riebl et al. (2015), shows the use of theory of planned behavior for understanding and predicting nutrition related behaviors in youth (Riebl et al., 2015). They found that TPB was most frequently utilized to assess healthy eating and sugary snack/beverage intake. It was also observed that among all the studies reviewed, attitude had the strongest relationship with dietary behavioral intention whereas the most frequent predictor of behavior was found to be the intention. One of the limitations of this systematic review was that most studies were observational with only three intervention studies. Even though these interventions were conducted on the youth, it was seen that the use of TPB was associated with beneficial outcomes in these interventions (Riebl et al., 2015).

Another study that used the TPB in improving the dietary behavior of students also showed that constructs of TPB namely attitudes, subjective norms and perceived behavior control were significantly different between control and intervention groups for the participants who were enrolled in the 4-week intervention (Zendehtalab et al., 2014). This study also validated the effective use of TPB in health promotion interventions in improving the participant's dietary behavior. Another application of TPB in relation to

the fruit and vegetable behavior was in older African American sample (O'Neal et al., 2014). They found that attitudes, subjective norms, and perceived behavioral control were associated with intention for fruit and vegetable consumption behavior.

Furthermore, social norms and intention were also related to the fruit and vegetable dietary behavior. This study also found TPB to be effective in describing the variations in consumption behavior of African Americans. They suggested utilizing the broader behavioral domains when using the TPB for health promotion interventions instead of emphasizing particular behaviors (O'Neal et.al., 2014). Further studies also evaluated the effectiveness of TPB in health promotion programs. A study conducted on older adults to determine fruit and vegetable intake with regards to TPB found out that perceived behavioral control was a dominant factor in determining both intention and consumption, followed by attitudes and subjective norms (Sjoberg et al., 2004).

Similarly, Seo et al. showed in their study about food additives that participants who perceived the information on food additives was adequate had positive attitudes about consuming processed food and behavioral intention than the majority of the participants (78%) that found the information to be insufficient (Seo et al., 2014). This suggests a link between information and knowledge with attitudes towards a particular behavior.

Web-based Nutrition Education

Internet use has increased tremendously over the past decade giving rise to the possibility of multiple ways to address health issues including nutrition related behaviors. Many studies among different populations (e.g. college students, WIC

participants, etc.) have tested the success of online nutrition education programs and found them effective in improving knowledge and nutrition related behavioral outcomes (Contento, 2008). Some of the barriers of traditional nutrition interventions can be reduced by delivering nutrition intervention through the web (Poddar et al., 2010). These hurdles may include lack of time both from the participant and educator, transportation issues, and other costs associated with educational materials, hiring/training educators and recruiting participants for such interventions. Delivering an online program has the potential to overcome some of these above-mentioned issues. Furthermore, the use of visual materials and pictures may aid in reducing literacy and language barriers (Rush et al., 2007). Therefore, the internet may prove to be a promising and cost-effective tool in providing nutrition education in diverse populations and ultimately improving their nutrition related behavior.

Purpose of the Study

With the current emphasis on cultural competency and providing culturally appropriate health services, studies are necessary to examine such interventions in different ethnic populations. Little research has been done in general nutrition education in South Asian population in the U.S. It is important to test the implementation and effectiveness of such programs in this group with the appropriate method of delivery of these programs. Culturally appropriate effective interventions are essential for this high risk South Asian population (National Institute for Health and Clinical Excellence, 2011).

Keeping the above mentioned factors in consideration, the purpose of this study was to develop, implement and evaluate the effectiveness of the theory-based online nutrition education program for South Asians living in United States. The hypothesis of this study was that an on-line education program will improve the mediators of health and nutrition behaviors for South Asians in the U.S.

Research Questions

The study will focus on the following research questions concerning the lessons and related behaviors:

1-How effective were the Lessons in:

- a) Increasing the consumption of Fruits and Vegetables?
- b) Increasing physical activity?
- c) Decreasing fast-food consumption?
- d) Increasing their use of food-labels?
- e) Weight management?
- f) Increasing their knowledge of healthy eating?

2-What were the effects of these lessons on the constructs of Theory of Planned behavior (behavioral intention, attitudes, perceived outcome expectations, knowledge, and self-efficacy/perceived behavioral control)?

CHAPTER II

LITERATURE REVIEW

Diet Quality of South Asians in the U.S.

In order to create successful nutrition education interventions for South Asians in the U.S., it is important to understand their eating habits. A recent study using the Healthy Eating Index (HEI 2010) has shown the diet quality of South Asians in the U.S. (Khan et al., 2016). The Healthy Eating Index (HEI 2010) assesses the quality of diet and is in accordance with the latest federal guidelines. HEI 2010 is composed of 12 factors out of which 9 are adequacy factors and 3 moderation factors. The adequacy factors include total fruit, whole fruit, total vegetables, greens and beans along with other components such as fatty acids and protein foods. The distribution of the HEI score is as follows: HEI of ≥ 80 suggests a healthy diet, HEI between 50-80 designate improvement in diet and ≤ 50 reflects a poor diet. The study conducted by Khan and colleagues shows that South Asians had an average score of 68 which requires an improvement in diet. The high rates of metabolic syndrome indicators in South Asians contradicts the relatively high HEI score. These results also indicate a need for tailored interventions for South Asians with a high prevalence of metabolic syndrome. In our present study, the focus of the nutrition education program is on some of the specific components of the HEI 2010 such as the fruits and vegetable intake, moderation in terms of portion control and proper label reading which can facilitate better dietary decisions.

South Asian Paradox

It is also important to understand the concept of “South Asian Paradox” when describing the dietary habits of South Asians. This paradox concerns the high rates of risk factors for CVD and diabetes in South Asians regardless of increased levels of vegetarianism in the South Asian region which brings into question the healthfulness of vegetarian diets (Singh et al., 2014 and Khan et al., 2016). Some of the prominent changes in the patterns of diets for Asian Indians that have occurred over time are substitution of white rice over brown rice, overconsumption of refined carbohydrates, change in the amount and types of cooking oils (more use of clarified butter or palm oil compared to other oils which have more atherogenic effects), and higher intake of fast foods and processed foods (Singh et al., 2014). The rates of vegetarianism in South Asians living in South Asia is higher in comparison to South Asians in the U.S. A recent study estimated that there are 2.4% vegetarians in their sample (n=15,665) of South Asians in the U.S. when compared to 33% or 1/3 vegetarians in the sample of individuals living in South Asia (Jaacks et al., 2016). This suggests a divergence from the the vegetarian pattern with possible increased intake of meat and animal products for individuals living in the U.S. vs. those living in South Asia. Meat consumption, in particular processed meat, has been found to be associated with a greater risk of developing diabetes in a diverse sample (18,527) of young adults (Mari-Sanchis et al., 2016).

Concept of Health in South Asians

The concept of health and disease can be interpreted differently in diverse populations and these differences can be explained by various sociodemographics factors. Religion and gender are two important contributors in understanding the variations that exist in the South Asian population (Tirodkar et al., 2011). A study conducted in Chicago on South Asian immigrants found important domains associated with physical, psycho-social, spiritual and behavioral aspects of health and disease. These factors can be used to develop health promotion interventions for South Asians. The participants stated behavioral elements such as diet and exercise along with avoiding stress in their understanding of the concept of health. Specifically, gender wise, South Asian men reported behavioral elements such as drinking and smoking to be disease causative in comparison to women who have relatively low number of these behaviors. South Asians tend to have a holistic approach to health and disease and this should be an important consideration for health promoting strategies (Tirodker et al., 2011).

South Asian Heart and Lifestyle Intervention (SAHELI)

In order to understand the importance of conducting evidence-based lifestyle interventions for diverse populations in a community setting, the SAHELI study should be considered. SAHELI stands for South Asian Heart and Lifestyle Intervention study which is currently being implemented to assess the feasibility and effectiveness of a community based, culturally appropriate prevention intervention. The objectives of that

study were to promote better dietary behaviors and physical activity for those South Asians that exhibited at least one cardiovascular disease risk factor (Kandula et al., 2013). This entailed dividing participant in control vs. intervention group where intervention participants received group classes and telephone support. This is one of the first studies to determine the effectiveness of a lifestyle intervention in South Asians with CVD indicators and results of this ongoing study can be used to guide community-based CVD prevention strategies for ethnic populations (Kandula et al., 2013). This is a relatively new research area to be explored for South Asians which are increasingly growing at a fast pace in the U.S. and can provide useful insight in determining the effectiveness of a large scale intervention.

Multimedia Interventions

Research has shown that multimedia interventions involving graphics, animations and videos can be useful in increasing knowledge and perceptions about prevention programs. Research conducted by Shah et al. (2015) found significant improvements in the cardiovascular health knowledge and perceptions related to the culturally specific heart disease prevention program developed for South Asians (Shah et al., 2015). This was a patient education program and proved beneficial in conveying health education to patients of diverse backgrounds. It was also designed to be used in both clinical or community based settings. In the current project, videos are used in combination with other strategies to deliver nutrition and health information through a web-based format that can be accessed through computers, smart-phones or tablets.

Nutrition Education Research in South Asians

There is a lack of research on nutrition education in South Asians. A systematic review of dietary and physical activity interventions in South Asians was performed by Chapman et al. who found only four studies in developed countries out of which none were theory based interventions (Chapman et al., 2013). One study, however, proposed that subjects may advance through the stages of change (readiness to change) with its community based program but this was described in terms of general risk instead of particular behaviors (Mathews et al., 2007). Additionally, none of the programs in the review were delivered online or through the web. Thus, in order to enhance the effectiveness of such interventions, it is vital to understand the processes and techniques that cause changes in people's attitude and behaviors (Michie and Abraham, 2004). Using a theory based approach when developing a program can aid in understanding these complex behaviors.

Importance of Pilot Studies

Pilot studies can be identical to feasibility studies which are used to direct the development of large scale interventions which is also one of the long-term goals of this program (Thabane et al., 2010). It is important to conduct a pilot study in order to understand how the program will work on a large scale. Based on the need in the literature about the development of specific programs tailored to the South Asian population, the focus of this dissertation is on the development, implementation and evaluation of an online nutrition education program for South Asians. This pilot program

is one of the initial programs that will be theory based, prevention program and will be addressing the health and nutrition related attitudes and behaviors of the South Asian population with the constructs of the theory of planned behavior.

CHAPTER III

METHODS

The population studied in this group is South Asians. As mentioned previously, South Asians are people who belong to or have a background from any of these countries: India, Pakistan, Bangladesh, Sri Lanka and other countries in the region (for the purposes of this study, the focus is on individuals from the Indian sub-continent). This study specifically focuses on South Asians, who are in the U.S. either as citizens, permanent residents or for work/study purposes. It is important to know the demographics of the subjects in order to detect any relationship between any demographic factors, elements associated with the use of nutrition education program and assessment of nutrition knowledge and behavior of the participants.

Sample Size

The optimal population size would be all South Asians in the U.S. but for sampling purposes, this study would focus on areas where South Asian communities are predominately settled. Inclusion criteria for the program were: (i) 18 years or older, (ii) South Asian background, and (iii) living in the U.S. These criteria will be incorporated into the pre-test survey instrument where participants will self-report in regards to the inclusion criteria. The participants will only be allowed to proceed forward with the survey if they meet the inclusion criteria.

To get an estimate about sample size, statistical tables were used (Clark-Carter, 2004). According to Clark Carter Table A15.3 (a) ,if one tailed test will be used, assuming the effectiveness of online nutrition education program and having a medium effect size of 0.3,a sample size of 70 would be useful if a statistical power of 0.80 is used (chance of making type II error is 20 %). According to Clark-Carter Table A15.3(b), if two tailed test is used with the assumption that online nutrition education may succeed or fail, using a medium effect size of 0.3 and if statistical power of 0.80 is being used, a sample size of 90 would be used. Participants from various platforms were invited to take part in the study but the main goal was to have as many subjects as statistically needed. The study was approved by the IRB of Texas A&M University.

Recruitment

Research has shown that word of mouth by members of the community or the researcher is an effective method for recruiting South Asians (Williams and Sultan, 1999). Hence the study also incorporated a convenience/snowball sampling to enroll subjects. Snowball sampling can be classified as a form of convenience sampling in which subjects are asked to suggest other people as possibly study participants (Jeanfreau and Jack, 2010). The members were recruited by confirming their South Asian background through self-reporting on the survey along with them being 18 years or older and living in the U.S. Multiple strategies were employed to recruit members such as personal contacts, word of mouth, emails, Facebook, South Asian Organizations, etc. Subjects seem to engage more actively if they believe that the researcher/educator is

sensitive and understanding of their culture. Keeping this under consideration, the researcher conducting the study also had a South Asian background. Studies have shown that forming relationships with participants is essential for the positive acceptance of lifestyle interventions in primary care (Whittemore et al., 2009). Furthermore, recruitment efforts started in August 2015 and were concluded in July 2016.

Design of the Nutrition Education Program

Dr. Contento's DESIGN stepwise procedure was used as a model framework to create the nutrition education program. There are six steps included in this procedure. Step 1 identifies the issue or concern and the behaviors associated with the issue. Step 2 entails identifying psychosocial determinants or mediators of behaviors. Then selecting the appropriate theoretical model constitutes Step 3. Stating clear educational objectives leads to Step 4 and designing activities for mediators is Step 5 according to this procedure. The last step, Step 6, is to plan evaluation for mediators and outcomes. Summative process evaluation was conducted to determine program effectiveness. Questions were asked if the intervention was effective in terms of the various target behavior.

This nutrition education program for South Asians was created following the stepwise DESIGN procedure. For needs assessment, information was gathered from literature and also from the data of a previous study "Nutrition knowledge and dietary behaviors in South Asians" to identify the issues of concern (Step 1) (Qamar, 2012). These concerns were low intake of Fruits and Vegetables (F/V), low Physical Activity

(PA) and importance of weight management, eating out and labelling guidance. In the study conducted by Qamar and Misra, the barriers and mediators to healthy eating were identified and qualitative assessment was done to determine people's perception of what healthy lifestyle is in terms of healthy eating and physical activity. Also diet quality scores were calculated from the nutrition subscale questions from the Health-Promoting Lifestyle Profile II survey and frequency of consumption of food group items was determined. Keeping all of this in consideration, psychosocial determinants and behaviors were identified (Step 2). The theory of planned behavior was chosen as the theoretical framework to guide the development of the program (Step 3). Clear objectives were identified for the 4 lessons: F/V, Smart shopping for F/V and storage, physical activity (PA) and healthy weight, and eating out and label reading to address the psychosocial determinants and related behaviors (Step 4). Relevant educational sessions and activities were planned keeping in mind the mediators, the target behaviors and objectives (Step 5). After the end of participation in the program, the participants were asked to evaluate the program and summative process evaluation was conducted to determine the effectiveness of the program (Step 6).

Lesson Plans

Four lesson plans were created which were incorporated in the website. A free of cost website was created by using Weebly which is a web-hosting service containing a drag-and-drop element to build a website. Motivational and action objectives were identified for the whole education program which included enhancing awareness about

significance of a healthy lifestyle and facilitating the ability to act by presenting opportunities to obtain appropriate nutrition/food related knowledge and skills. These lessons focused on fruit and vegetable intake, physical activity, weight management, label reading, portion control, healthy eating out strategies, and goal setting. Lesson 1 focused on the health benefits of fruit and vegetable intake and recommended serving sizes. Lesson 2 emphasized the importance of shopping smart for F/V, seasonal F/V, and proper storage of F/V. Lesson 3 aimed to increase awareness about the health benefits of physical activity, evaluate individual weight and BMI, recommendations of physical activity and how it can be incorporated in lifestyle. The use of SuperTracker was also integrated in order to provide participants a tool to monitor their daily diet and physical activity. The last lesson focused on the general healthy eating habits, label reading, portion control and healthy eating strategies when eating outside. The details of each lesson plan is presented in a table format in Appendix B.

The four lessons were distributed to the participants on a weekly basis via email reminders to check the website (<http://southasiannutrition.weebly.com>) and complete one lesson/week. Total time commitment for one respondent was about 6 weeks for about 15 minutes/week, with pre-test survey sent the first week, then the 4 educational materials and activities to be completed in the following 4 weeks and the post-test survey sent by the sixth week. Pre-test and post-test surveys were sent through emails to the participants who indicated to be a part of the study along with briefly describing the study, timeline and what is expected of them.

Survey Instrument

The questionnaire used in this study contained evaluation and intention questions which were helpful in knowing the effectiveness of the program. The “effectiveness” of the program was calculated based on the evaluation question which asked the participants questions regarding the program and with answer options ranging from Strongly Agree to Strongly Disagree. The pre-test and post-test results were compared to determine if any significant changes are present among attitudes, confidence towards fruit and vegetables, fruit and vegetable intake and other factors. Intentions questions were asked to determine the likelihood of carrying out the particular behavior.

In order to make healthy eating behavioral changes, possessing knowledge about healthy eating plays an important role. Knowledge is usually a prerequisite for making healthy changes, even if it does not necessarily lead to actual behavioral amendments (Raberg Kjollesdal et al., 2011). The knowledge questions related to the educational materials were used to assess the current fruit and vegetable knowledge of this population. In regards to the evaluation questions, there were four process questions, four knowledge questions, one social norm perception question and six questions related to the behavioral intention. The intention and evaluation questions were pre-tested. According to the feedback received by administering the survey to about 10 South Asian individuals and their thoughts on each question, the questions were modified for clarification. This pre-testing of questionnaire did help a lot in refining how to better word the questions that would make sense to the general public.

Other questions associated with the health and nutrition behaviors and related psychosocial determinants were taken from the following validated surveys for adults:

- Food attitudes and Behavior (FAB) survey by National Cancer Institute (NCI) which measures F/V consumption, eating behaviors, health, PA, and demographic data.
- Brief psychosocial scales relating to F/V and healthy eating developed by Norman and colleagues (Norman et al., 2010)
- F/V shopping practice scales developed by Baranowski and colleagues (Baranowski et al., 2006)

Qualtrics platform was used to upload the pre- and post-test surveys and the survey link was sent to participants. The detailed survey instrument is attached in Appendix A.

Statistical Analysis

The statistical analyses were conducted using SPSS (Version 24). Statistical significance was established by a level of 0.05 or less for all the tests. Principal Components Analysis (PCA) is typically used with multiple indicators that measure each concept in studies such as this. PCA was employed with varimax rotation was used to determine any factors for all the items measured. Factors with an Eigenvalue of one criterion were retained along with variables that loaded high on a given factor. This value was set at >0.500 to determine the factors. The resulting factors then served as new variables for multiple linear regression analyses. Independent t-tests, and regression analyses were conducted to determine changes in health behaviors and constructs of the

theory before and after the program as these tests are commonly used with theoretical constructs and behavioral elements. Regression Analysis were also conducted to see if a relationship existed between sociodemographic, behavioral and theoretical constructs variables. In addition, basic descriptive stats were used for the demographic variables. The effectiveness of the program was determined by the evaluation questions which were pre-tested.

CHAPTER IV

RESULTS

Demographics

For this study, 166 South Asians completed the pre-test survey. The demographic characteristics of the sample are presented in Table 1. Two major groups of South Asians constituted the majority of the sample with 57.8% people of the Indian background and 36.1% people representing the Pakistani background. In terms of Nationality, U.S. citizens constituted 41.3% and Indian nationals represented 45.3% of the sample with other nationalities in lesser numbers. Those who were foreign born, about 43.2% have been in the U.S. for less than 5 years. The mean age of the group was 27.4 ± 7.41 which represented a relatively young sample. With regards to gender, there were 58.4% females and 41.5% males in the group. About 67% of individuals reported single (never married), follow by 16.7% of those married with children.

Table 1: Demographics of the participants		
Variable	Frequency n=166	Percentage
South Asian Background		
Indian	96	57.83%
Pakistani	60	36.14%
Bangladeshi	6	3.61%
Others	4	2.41%
Nationality		
U.S. Citizen	62	41.33%
Indian	68	45.33%
Pakistani	17	11.33%
Bangladeshi	1	0.67%
Other	2	1.33%
Age	138	27.42±7.41
Gender		
Males	69	41.57%
Females	97	58.43%
Mean Body Mass Index (BMI)	98	24.15±3.69
Marital Status		
Single, never married	100	67.11%
Married without children	18	12.08%
Married with children	25	16.78%
Divorced	4	2.68%
Separated	0	0.00%
Widowed	0	0.00%
Living w/ partner	2	1.34%
Length of Residence in the U.S.(if foreign born)		
Less than 5 years	48	43.24%
5-10 years	39	35.14%
10-15 years	13	11.71%
15-20 years	5	4.50%
more than 20 years	6	5.41%

In terms of educational background as shown in Table 2, about 29% of the participants had less than a college degree whereas rest of the participants possessed a Bachelor's degree or higher. Additionally, about 39% of participants held a Master's degree and such individuals constituted the highest group in terms of education.

Table 2: Educational background		
Education background of participants	Frequency	Percentage (%)
Less than High School	1	0.68%
High School / GED	22	14.97%
Some College	14	9.52%
2-year College Degree	6	4.08%
4-year College Degree	39	26.53%
Master's Degree	57	38.78%
Doctoral Degree	2	1.36%
Professional Degree (JD, MD)	6	4.08%
Mother's Educational Background		
Less than High School	12	8.70%
High School/GED	12	8.70%
Some college	16	11.59%
2-year College Degree	18	13.04%
4-year College Degree	45	32.61%
Master's Degree	28	20.29%
Doctoral Degree	3	2.17%
Professional Degree(JD,MD)	4	2.90%
Father's Educational Background		
Less than High School	5	3.57%
High School/GED	7	5.00%
Some college	13	9.29%
2-year College Degree	12	8.57%
4-year College Degree	50	35.71%
Master's Degree	35	25.00%
Doctoral Degree	9	6.43%
Professional Degree(JD,MD)	9	6.43%

Fruit and Vegetable Intake

The fruit and vegetable intake was measured by the Food Attitude and Behaviors (FAB) survey developed by the National Cancer Institute. According to the Dietary Guidelines for Americans, the range for the current vegetable recommendations is 3-4

cups equivalent for males and 2.5-3 cups equivalent for females. These guidelines make the range of 2.5-4 cup equivalents vegetables for males and females combined for the age group 19-30 years (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). In this study, 27 years was the mean age for participants. In comparison to these recommendations, only 35.4% of the South Asian participants were consuming >2 cups for vegetables pre-test. Similarly, the range for the current fruit intake recommendations from the Dietary Guidelines for Americans is 2-2.5 cups equivalent for males and 1.5-2 cups equivalent for females in the age group of 19-30 years. This make the range of fruits for adult males and female in this age group to be 1.5-2.5 cups equivalent. About 52% of the South Asian participants in this group were meeting the recommendations of >1 cup of fruit/day. The vegetable and fruit intake for South Asians is presented in Table 3.

Table 3: Vegetable and fruit intake for South Asians (pre-intervention)

Amount in Cups	Vegetable Intake (n)	Vegetable Intake %	Fruit Intake (n)	Fruit Intake %
None	15	15.15%	12	12%
½ cup or less	3	3.03%	2	2%
½ cup – 1 cup	34	34.34%	34	34%
1-2 cups	12	12.12%	14	14%
2-3 cups	29	29.29%	29	29%
3-4 cups	5	5.05%	5	5%
4 cups or more	1	1.01%	4	4%
Total	99	100%	100	100%

Water and Beverage Intake

Water consumption was measured by the Food Attitude and Behaviors (FAB) survey developed by the National Cancer Institute. In terms of the water intake, about 45% of participants indicated consuming 4-7 cups of water/day. In contrast, only 18% participants indicated consuming 1-3 cups of soda/day while majority (81.82% and 92.93%) indicated consuming no soda or alcohol respectively on a day basis. The water and beverage intake for the participants is shown in Table 4.

Table 4: Water and beverage intake (pre-intervention)

Water and Beverage intake Consumption in cups	Water		Soda		Alcohol	
	Frequency	%	Frequency	%	Frequency	%
None (0 cups)	2	2%	81	81.82%	92	92.93%
1-3 cups	21	21%	18	18.18%	6	6%
4-7 cups	45	45%	0	0%	1	1%
8 or more cups	32	32%	0	0%	0	0%

Health Status

In regards to health status mentioned in Table 5, about 40% participants indicated having good health. When asked about if they worried about their health in the past year, 52% participants indicated worrying “somewhat” to “quite a bit” in the past year. Conversely, when asked if worrying about health led them to change their dietary behavior, 34.4% people indicated “somewhat” changing the way they eat.

Table 5: Perceived health status of the participants (pre-intervention)		
Health Status	Frequency	Percentage
General Health		
Excellent	4	3.96%
Very Good	29	28.71%
Good	40	39.60%
Fair	25	24.75%
Poor	3	2.97%
Worry about Health		
Not at all	7	7%
A little bit	23	23%
Somewhat	26	26%
Quite a bit	26	26%
All the time	18	18%
Eating Behavior change related to health		
Not at all	11	11.11%
A little bit	21	21.21%
Somewhat	34	34.34%
Quite a bit	24	24.24%
All the time	9	9.09%

Weight Status

With regards to weight status, as shown in Table 6, 43.56% people indicated as being at the right weight. On the other hand, about 40% people reported being slightly overweight and 11.88% being very overweight. This ties in with the mean BMI for this group which is $24.15 \pm 3.69 \text{ kg/m}^2$ and BMI of above 23 is considered overweight for Asians according to WHO standards. Interestingly, a majority (64%) of the participants were trying to lose weight also. It is to be noted that all of the weight data was self-reported.

How do you describe your weight?	Frequency	Percentage	Mean
Very underweight	1	0.99%	3.57±0.79
Slightly underweight	4	3.96%	
About the right weight	44	43.56%	
Slightly overweight	40	39.60%	
Very Overweight	12	11.88%	
Are you currently trying to gain weight, lose weight, or neither?			
Gain weight	13	12%	2.10±0.59
Lose weight	64	64%	
Neither of these	23	23%	

Attitudes and Opinions about Fruit and Vegetable Consumption

In terms of the attitudes and opinions about eating fruit and vegetables, the participants were asked the question that “The following statements are different opinions about eating fruits and vegetables. Please rate HOW IMPORTANT each statement is to your decision to eat 5 fruits and vegetables a day”. It can be observed from the table 7 that “I would be doing something good for my body if I ate fruits and vegetables” ranked highest among all the eight items with a mean of 4.26±0.86 which is between “Very Important” and “Extremely Important”. The item that ranked least was “I would rather eat sweets or high fat snacks than fruits and vegetables.” With a mean of 1.89±1.07 which falls between “Not Important” and “Slightly Important”.

Table 7: Attitudes towards fruit and vegetable consumption (pre-intervention)

Question	Not Important %(n)	Slightly Important %(n)	Moderately Important %(n)	Very Important %(n)	Extremely Important %(n)	Total (n)	Mean±SD
I would have more energy if I ate fruits and vegetables.	6.73% (7)	7.69% (8)	27.88% (29)	42.31% (44)	15.38% (16)	104	3.52±1.06
It takes too much time to prepare fruits and vegetables.	24.27% (25)	16.50% (17)	32.04% (33)	20.39% (21)	6.80% (7)	103	2.69±1.23
I would be doing something good for my body if I ate fruits and vegetables.	1.94% (2)	2.91% (3)	6.80% (7)	43.69% (45)	44.66% (46)	103	4.26±0.86
I would rather eat sweets or high fat snacks than fruits and vegetables.	48.54% (50)	25.24% (26)	17.48% (18)	5.83% (6)	2.91% (3)	103	1.89±1.07
People close to me would be pleased if I ate fruits and vegetables.	20.39% (21)	8.74% (9)	18.45% (19)	26.21% (27)	26.21% (27)	103	3.29±1.46
Fruits and vegetables do not satisfy my hunger for very long.	14.56% (15)	14.56% (15)	27.18% (28)	31.07% (32)	12.62% (13)	103	3.13±1.24
Eating more fruits and vegetables helps me manage my weight.	9.71% (10)	8.74% (9)	18.45% (19)	40.78% (42)	22.33% (23)	103	3.57±1.20
Fresh fruits and vegetables are too expensive.	37.25% (38)	16.67% (17)	20.59% (21)	18.63% (19)	6.86% (7)	102	2.41±1.33

Minimum=1, Maximum=5

Healthy Eating Strategies

In terms of healthy eating strategies section of the survey developed by Norman and colleagues (2010), the participants were asked the question “The following are activities, thoughts, and feelings people use to help them change their dietary habits. Think of any similar experiences you may be having or have had in the past month.

Then rate HOW OFTEN you do each of the following using the scale below”. It can be seen from Table 8 that the item “I think about the benefits I will get from eating healthy” ranked highest among all the 15 questions with a mean of 3.8 ± 1.12 which is between “Sometimes” and “Often”. The item that ranked least was “I put reminders around my house to eat healthy foods.” with a mean of 1.93 ± 1.13 which falls between “Never” and “Almost Never”.

Table 8: Healthy eating strategies (pre-intervention)

Question	Never % (n)	Almost Never % (n)	Sometimes % (n)	Often % (n)	Many Times % (n)	Total (n)	Mean±SD
I look for information about eating healthy foods.	5.77% (6)	8.65% (9)	29.81% (31)	32.69% (34)	23.08% (24)	104	3.59±1.11
I keep track of what I eat.	7.69% (8)	18.27% (19)	36.54% (38)	20.19% (21)	17.31% (18)	104	3.21±1.16
I find ways to get around the things that get in the way of eating healthy foods.	4.85% (5)	19.42% (20)	42.72% (44)	27.18% (28)	5.83% (6)	103	3.10±0.94
I think about how my surroundings affect foods I eat (surroundings such as fast food restaurants, vending machines, & pre-packaged foods in store).	6.80% (7)	7.77% (8)	37.86% (39)	35.92% (37)	11.65% (12)	103	3.38±1.02
I put reminders around my house to eat healthy foods.	46.60% (48)	30.10% (31)	11.65% (12)	6.80% (7)	4.85% (5)	103	1.93±1.13
I reward myself for eating healthy foods.	37.86% (39)	19.42% (20)	27.18% (28)	9.71% (10)	5.83% (6)	103	2.26±1.22
I do things to make eating healthy foods more enjoyable.	21.36% (22)	12.62% (13)	29.13% (30)	24.27% (25)	12.62% (13)	103	2.94±1.31
I think about the benefits I will get from eating healthy foods.	5.88% (6)	6.86% (7)	16.67% (17)	40.20% (41)	30.39% (31)	102	3.82±1.12
I try to think more about benefits of eating healthy foods and less about hassles of eating healthy foods.	2.91% (3)	8.74% (9)	34.95% (36)	33.98% (35)	19.42% (20)	103	3.58±0.99
I say positive things to myself about eating healthy foods.	11.76% (12)	10.78% (11)	22.55% (23)	35.29% (36)	19.61% (20)	102	3.40±1.25
When I get off track from my healthy eating goals, I tell myself I can start again and get right back on track.	5.83% (6)	13.59% (14)	27.18% (28)	30.10% (31)	23.30% (24)	103	3.51±1.16
I have friend/family member who encourages me to eat healthy foods.	11.65% (12)	16.50% (17)	16.50% (17)	35.92% (37)	19.42% (20)	103	3.35±1.28
I try different kinds of healthy foods so that I have more choices.	4.85% (5)	13.59% (14)	27.18% (28)	36.89% (38)	17.48% (18)	103	3.49±1.08
I set goals to eat healthy foods.	12.62% (13)	21.36% (22)	26.21% (27)	24.27% (25)	15.53% (16)	103	3.09±1.25
I make back-up plans to be sure I eat healthy foods.	18.45% (19)	25.24% (26)	31.07% (32)	17.48% (18)	7.77% (8)	103	2.71±1.18

Confidence Choosing Fruits and Vegetables

Determination of confidence in choosing fruits and vegetables was conducted by 6 items which questioned the participants, “There are many things that can get in the way of choosing to eat 5 fruits and vegetables each day. Rate how confident you are that you can do the following using the scale below” with options ranging from “Not at all Confident” to “Extremely Confident”. As Table 9 shows, the participants were the most confident about “Drink 100% fruit juice instead of soda or fruit punch?” with a mean of 3.50 ± 1.24 which ranged between “Moderately confident” to “Very Confident”. The item which the participants were the least confident about was a tie between “Eat 5 servings of fruits and vegetables everyday?” and “Eat fruits and vegetables when I am upset or having a bad day?” with a mean value of 2.44 ± 1.09 and 2.44 ± 1.26 which fell between “Somewhat confident” to “Moderately confident”.

Table 9: Confidence in consuming fruits and vegetables (pre-intervention)

Question	Not at All Confident % (n)	Somewhat Confident % (n)	Moderately Confident % (n)	Very Confident % (n)	Extremely Confident % (n)	Total (n)	Mean±SD
Eat 5 servings of fruits and vegetables every day?	21.57% (22)	35.29% (36)	23.53% (24)	16.67% (17)	2.94% (3)	102	2.44±1.09
Drink 100% fruit juice instead of soda or fruit punch?	4.90% (5)	20.59% (21)	23.53% (24)	21.57% (22)	29.41% (30)	102	3.50±1.24
Eat fruits and vegetables for a snack instead of chips or candy?	7.00% (7)	18.00% (18)	37.00% (37)	27.00% (27)	11.00% (11)	100	3.17±1.07
Eat fruits and vegetables when eating out at a restaurant?	21.57% (22)	24.51% (25)	22.55% (33)	22.55% (23)	8.82% (9)	102	2.73±1.27
Eat fruits and vegetables when I am upset or having a bad day?	26.73% (27)	33.66% (34)	18.81% (19)	10.89% (11)	9.90% (10)	101	2.44±1.26
Eat fruits and vegetables when I am at a social event?	19.61% (20)	30.39% (31)	24.51% (25)	14.71% (15)	10.78% (11)	102	2.67±1.25

Fruit and Vegetable Shopping Practices

The fruit and vegetable shopping practices were measured by seven items which asked the participants to best describe their frequency of the F/V shopping habits on a scale of 1-5 with 1 being “Never” and 5 being “All of the time” and is presented in Table 10. It can be observed from the table that the item “look in refrigerator/ pantry before you go shopping to see what you need...” ranked highest among the 7 items with a mean of 3.78±1.13. This mean falls between “Sometimes” and “Most of the times”. On the other hand, the item that ranked the least was “use coupons for food?” with a mean of 2.15 ±1.18 which has an inclination towards “Rarely”.

Table 10: Fruit and vegetable shopping practices (pre-intervention)

Question	Never %(n)	Rarely %(n)	Sometimes %(n)	Most of the times % (n)	All of the Time % (n)	Total (n)	Mean±SD
1. look in refrigerator/ pantry before you go shopping to see what you need?	2.88% (3)	13.46% (14)	19.23% (20)	31.73% (33)	32.69% (34)	104	3.78±1.13
2. check for vegetables/fruits or 100% juice on sale when you are at the store?	4.81% (5)	12.50% (13)	33.65% (35)	24.04% (25)	25.00% (26)	104	3.52±1.13
3. read label for nutrients?	7.77% (8)	15.53% (16)	24.27% (25)	28.16% (29)	24.27% (25)	103	3.46±1.23
4. use a grocery list when you shop?	8.65% (9)	13.46% (14)	23.08% (24)	25.00% (26)	29.81% (31)	104	3.54±1.28
5. check for vegetables/fruit or 100% juice on sale before going to the store?	31.07% (32)	25.24% (26)	20.39% (21)	10.68% (11)	12.62% (13)	103	2.49±1.36
6. plan menus for the coming week?	30.10% (31)	25.24% (26)	20.39% (21)	15.53% (16)	8.74% (9)	103	2.48±1.30
7. use coupons for food?	39.22% (40)	24.51% (25)	25.49% (26)	3.92% (4)	6.86% (7)	102	2.15±1.18

Factor Analysis

Factor analysis for attitudes towards fruit and vegetable consumption

Factor Analysis was performed on attitudes and confidence towards eating fruits and vegetables, fruit and vegetable shopping practices and healthy eating strategies. In regards to attitudes towards fruit and vegetables, 4 main factors were formed out of which two were kept as they explained the most items. 70.9 % of the total variance was explained by the factors and those items were kept which had a value >0.5. Factor 1 was named Benefits Related to fruit and vegetables (FV Benefits) because items that loaded high on this factor were related to the attitudes about benefits of fruit and vegetables. These items were having more energy, doing something good for the body, and weight management in regards to fruit and vegetable consumption. Factor 2 was

named Perceived Barriers related to Fruits and Vegetable consumption (FV Costs) because items that loaded high on this factor were related to the negative attitudes/barriers towards the consumption of fruits and vegetables. These items included too much time to prepare fruits and vegetables, they don't satisfy hunger and expensiveness of fruits and vegetables. The other two factors produced only had one item loaded high on each factor. These items were about attitude towards preference about sweets and high fat snacks instead of fruits and vegetable and social support towards fruits and vegetables. Hence those two questions were taken out and used separately in the regression analysis.

Factor analysis for confidence towards fruit and vegetable consumption

Two factors were produced for confidence towards fruit and vegetable consumption which explained 65.6% of the total variance. Factor 1 had high loading on five out of the six items. This factor was named Confidence towards fruit and vegetable consumption (FV Confidence) and included items such as consumption of fruits and vegetables for recommended servings, as snacks, when eating out, in a bad mood and at a social event. The second factor only loaded high on one item which was to drink 100% juice instead of soda so that factor was dropped and this item was used separately.

Factor analysis for fruit and vegetable shopping practices

Factor Analysis performed on fruit and vegetable shopping practices created 2 factors which explained 54.1% of the total variance. Five out of the six items loaded

high on Factor 1, which was named Fruit and Vegetable Shopping Practices (FV Shopping). This included items such as check for F/V on sale before going to the store and then at the store, read label for nutrients, use a grocery list, planning menus for the week and using coupons. The one item which loaded high on second factor, which was dropped, was look in refrigerator/pantry before going shopping to see what you need. Hence this item was used by itself in the regression analysis.

Factor analysis for healthy eating (HE) strategies and behaviors

For eating habits, factor analysis was performed on the 15 items which produced 4 factors explaining 64.7% of the total variance. Factor 1 loaded high on all items except the item about social support for healthy eating. This item was taken out and used separately. Factor analysis was performed on the remaining 14 items. Four items constituted the Healthy Eating External Factor which explained about 55% of the variance. These items included finding ways to get around things in the way of healthy eating, surroundings affecting food, reminders about healthy foods, and reward for healthy foods. The rest of the 10 items constituted the Individuals Healthy Eating Factor with a variance of about 49% which included items such as looking for information, keeping track of what you eat, making healthy eating enjoyable, think about benefits of healthy eating, think less about hassles of healthy eating, saying positive things to oneself for healthy eating, getting back on track, trying a variety of healthy foods, setting goals, and making back-up plans to eat healthy foods.

Regression Analysis

Regression analysis with vegetable intake

Regression analysis was performed with Vegetable Intake as the dependent variable and Fruit and Vegetable (F/V) benefits, F/V costs, F/V Confidence, F/V Shopping Practices, Social Norms, F/V Knowledge, External Healthy Eating (HE) Habit factors and Individual HE Factors as independent variables to determine relationships between pre-test factors. As shown in Table 11, F/V knowledge was positively associated ($p < 0.05$) with the intake of vegetables suggesting that greater the knowledge about the recommended amounts of vegetables and fruits, greater the consumption of vegetables. Collinearity Statistics were performed and none of the variables were found to be correlated. When regression analysis was performed between vegetable consumption as the dependent variables and other control variables and health-related variables as the independent variables as shown in Table 12, it was found that weight status was positively and significantly associated with increased vegetable intake. This suggests that people who considered themselves heavier had a higher intake of vegetables. Also, preference for sweets and snacks was significantly and negatively associated with vegetable consumption, as shown in Table 12, suggesting that those who had a higher preference for sweets and snacks had lower intake of vegetables. Collinearity tests were performed and none of the independent factors were highly correlated with each other.

Table 11: Intake of Vegetables regressed on attitudes & behaviors towards eating vegetables (pre-intervention)

Predictors/ Independent Variables	Unstandardized Coefficients	Standardized coefficients
F/V Benefits	.122	.077
F/V Costs	-.258	-.170
F/V Confidence	.259	.176
F/V shopping practices	.031	.020
Social Norms	-.159	-.104
F/V Knowledge	.469*	.308
External HE Factors	.030	.020
Individual HE Factors	.236	.156

*Significant at 0.01 level

Adjusted R²=0.226

Table 12: Intake of vegetables regressed on control variables and other health related factors (pre-intervention)

Predictors/ Independent Variables	Unstandardized Coefficients	Standardized coefficients
Gender	.415	.149
Education	-.050	-.054
Length of Stay in US	.141	.120
Health	-.210	-.123
BMI	-.048	-.135
Weight description	.585*	.363
Soda	-.470	-.121
Meal and TV watching	.001	.002
Physical Activity	-.487	-.131
Seasonal Fruit and Vegetables	-.140	-.050
Preference for sweets/fatty snacks	-.363*	-.262
Substitute juice for soda	.224	.191
Fridge/pantry check before shopping	.293	.219
Worry about health	.226	.179
Fast food consumption	.043	.051

*Significant at 0.05 level

Adjusted R²=0.279

Regression analysis with fruit intake

When regression analysis was performed of fruit intake with the created factors of attitudes and behavior towards eating fruits and vegetables, it was found that the frequency of control over the external factors of healthy eating (items included finding ways to get around things in the way of healthy eating, surroundings affecting food,

reminders about healthy foods, and reward for healthy foods), which was abbreviated as HE external factors, was significantly and positively associated with fruit intake as shown in Table 13. This suggested that people who were more frequently engaging in these external factors of healthy eating such as their surroundings affecting food and putting reminders to eat healthy had a higher intake of fruits. When the intake of fruits was regressed with other control variables such as gender, education and other health-related behaviors such as consumption of fast-food, soda, engaging in PA etc., none of the factors were significantly associated with fruit intake as shown in Table 14.

Table 13: Intake of fruit regressed on attitudes and behaviors towards eating fruits and vegetables (pre-intervention)

Predictors/ Independent Variables	Unstandardized Coefficients	Standardized coefficients
FVO benefits	-.198	-.124
FVO costs	-.131	-.085
FV confidence	.178	.119
FV shopping	-.192	-.127
FV social	.285	.184
FV knowledge	.119	.077
HE external factors	.464*	.302
HE individual factors	.099	.065

*Significant at 0.05 level

Adjusted R²=0.079

Table 14: Intake of fruits regressed on control variables and other health related factors (pre-intervention)

Predictors/ Independent Variables	Unstandardized Coefficients	Standardized coefficients
Gender	-.509	-.181
Education	-.059	-.063
Length in US	.345	.290
Health	.172	.099
BMI	-.062	-.172
Weight description	-.068	-.042
Soda	-.084	-.021
Meal TV	-.010	-.040
Physical Activity	-.283	-.075
Seasonal Fruits/Vegetables	-.132	-.047
Preference for sweets/snacks	-.189	-.135
Substitute juice for soda	.116	.098
Fridge/pantry check before shopping	.242	.179
Worry about health	.319	.250
Fast food consumption	-.064	-.075

Adjusted R² = -0.48

Evaluation Results

There were 66 respondents who signed up to participate in the program by providing their email addresses. Out of these, 42 participants (retention rate 63.6%) returned the post-test and retrospective evaluation surveys. The items in the post-test survey assessed the evaluation of the program, relationship of constructs of Theory of

Planned Behavior with intention and behavior, and the targeted nutrition and health related actions. In regards to the evaluation questions, there were four process questions, four knowledge questions, one social norm perception question and six questions related to the behavioral intention. All the participants who returned the post-test survey found the program to be helpful. They indicated that the program was helpful in increasing their knowledge about general nutrition, healthy eating, benefits of physical activity, and weight management. Eighty-eight percent of participants reported that they would recommend the nutrition education program to their family and friends. This data is presented in Table 15. With regards to intentions related to health behaviors, intention was determined using the question “On a scale of 1-10, how likely are you to change your dietary habits after this intervention?”. The intention data is presented in Table 16.

Table 15: Evaluation of the program

Items	n	Strongly Agree(%)	Agree (%)	Neither Agree nor disagree(%)	Disagree (%)	Strongly Disagree (%)
This web-based nutrition education program was overall helpful	42	35.71	57.14	0	7.14	0
The educational materials helped in increasing your knowledge about general nutrition and healthy eating.	42	42.86	47.62	4.76	4.76	0
The educational materials helped in increasing your knowledge about benefits of Physical Activity and weight management.	42	42.86	42.86	14.29	0	0

Table 15: Evaluation of the program (Continued)

Items	n	Strongly Agree (%)	Agree (%)	Neither Agree nor disagree(%)	Disagree (%)	Strongly Disagree (%)
The educational materials helped in increasing your knowledge about portion control.	42	35.71	47.62	14.29	2.38	0
People who are close to me think that it important to have credible nutrition knowledge for the prevention of diseases.	42	38.10	47.62	7.14	7.14	0

Table 16: Intentions related to health behaviors

Questions	n	Mean	Std. Deviation
On a scale of 1-10, how likely are you to change your dietary habits after this intervention?	42	6.43	2.13
On a scale of 1-10, how likely are you to improve your dietary habits after this intervention?	41	6.44	2.23
On a scale of 1-10, how likely are you to increase your consumption of F/V after this intervention?	40	6.13	2.16
On a scale of 1-10, how likely are you to increase your physical activity after this intervention?	30	6.43	2.39
On a scale of 1-10, how likely are you to use food labels after this intervention?	41	6.46	2.05
On a scale of 1-10, how likely are you to control your portions after this intervention?	32	7.13	1.90

1=Least likely

10=Most likely

Recommendations/Suggestions for the Program

Some of the recommendations given by the participants to improve the program were having a video/presentation, shorter surveys, emails to be sent on weekends/

weekday evenings when people can check instead of during workday, sample meal plans, individualized, more interactive programs. Other suggestions were providing incentives, sending short text reminders with a catchy title and promoting healthy apps. When asked about which method of delivery would the participants prefer for future nutrition education, a majority (about 59%) of the participants said they would prefer online/web-based method of delivery followed by 23% who reported face-to-face. Other methods such as group-based, direct mail, telephone etc. had even lower percentages.

Post-test Results

Regression analysis

Regression analysis was performed with post-test fruit intake as the dependent variable and intention to consume fruits and vegetables, confidence/self-efficacy towards eating fruits and vegetables, attitudes towards fruits and vegetables, healthy eating strategies and social norms as the independent variables. Results showed that intention to consume fruits and vegetables was significantly and positively associated with fruit intake suggesting that those who had intentions to consume fruits and vegetables had higher fruit intake. No significant association was found with any other variable.

Comparatively, regression analysis was performed with vegetable intake as the dependent variable and intention to consume fruits and vegetables, confidence/self-efficacy towards eating fruits and vegetables, attitudes towards fruits and vegetables, healthy eating strategies and social norms as the independent variables. There were no

significant associations found when vegetable intake was regressed with the above mentioned factors.

Independent t-tests and pre-post differences

An independent-samples t-test was conducted to compare various factors pre- and post test. In terms of fruit intake, there was no significant difference in the intake pre-test (M=3.77, SD=1.52) and post-test (M=3.97, SD=1.49) as shown in Table 17. Similarly, for vegetable intake, there was no significant difference in the intake pre-test (M=35.6, SD=1.4) and post-test (M=3.94, SD=1.27). When looking at attitudes towards fruits and vegetables before and after the intervention, there was no significant difference in the pre test (M=24.712, SD=4.53) and post-test (M=25.02, SD=4.61) scores. Also, there were no significant differences found between label reading, PA and weight status between pre and post-test results.

However, significant ($p < 0.05$) differences were found between results for healthy eating strategies pre-test (M=47.396, SD=10.7) and post-test scores (M=52.552, SD=8.97) which suggested an improvement in the healthy eating score after the intervention. Higher the score, healthier were the eating strategies. Similarly, there were significant differences ($p < 0.05$) in confidence towards eating fruits and vegetables pre-test (M=16.91, SD=4.84) and post-test (M=19.72, SD=4.89) suggesting an improvement in positive attitudes towards fruits and vegetables. Significant differences ($p < 0.05$) were found in fast-food consumption when pre (M=2.36, SD=1.68) and post test results

(M=1.52, SD=0.73) were compared. This indicates that there was a reduction in fast-food consumption after the program.

Table 17 : Pre- & Post-program comparison in behaviors & constructs of TPB

Factor	Mean ± SD (Pre-test)	Mean± SD (Post-test)	P-value
Fruit Intake	3.77±1.52	3.79±1.49	0.93
Vegetable Intake	3.56±1.49	3.94±1.27	0.19
Attitudes towards F/V Intake	24.71±4.53	25.02±4.61	0.71
Healthy Eating Strategies	47.39±10.76	52.55±8.97	0.01*
F/V Shopping Behavior	19.04±4.47	20.36±5.43	0.146
Confidence related to F/V Consumption	16.91±4.84	19.72±4.89	0.003*
Weight Change	3.57±0.79	3.69±0.66	0.418
Fast Food consumption	2.36±1.68	1.52±0.73	0.001*
Physical Activity	3.51±1.34	3.59±1.30	0.793

* Significant at P<0.05

CHAPTER V

DISCUSSION

This study looked at multiple demographic and psychosocial factors related to health and dietary behaviors in South Asians and also determined any post-program changes in these factors. In regards to demographic characteristics, this sample, in particular was a highly educated group as is evident by 8.7% participants having less than high school education. A recent report by the USDA, Economic Research Service sheds light on the relationship between education level and vegetable consumption. Similarly, a Study by Lin shows that higher education level corresponded with increased vegetable (non-potato and non-tomato) consumption (Lin, 2016). Additionally, the report by USDA also observed that total vegetable consumption decreased from 1994 to 2008 for all the racial/ethnic groups including non-Hispanic white, non-Hispanic blacks, Hispanics, and others among all age groups. College-educated adults had a consumption of 187.4 pounds of total vegetables per person, per year compared to 158.2 pounds per person per year for those adults having less than high school education (Lin, 2016).

Most of the participants in this study were young South Asian adults with a mean age of 27.42 ± 7.41 years. According to the Dietary Guidelines for Americans 2015-2020, the guidelines report that young adults and adolescents are farther away from recommended intakes for healthy eating in comparison to older Americans and young children. There is an urgent need for Americans to shift intakes towards healthier eating

patterns. In particular, for South Asians, a culturally appropriate nutrition education program can help these young adults to achieve a healthier eating pattern.

In the baseline comparison to Dietary Guidelines recommendations for vegetables and fruit intake, only 35.4% of the participants were consuming >2 cups of vegetables and about 52% of participants were meeting the recommendations of >1 cup of fruit/day for this age group. In regards to the post-test changes in vegetable consumption, there was an improvement in the post-test consumption but it did not reach significance. For fruit intake, there were no significant difference in consumption after the program. The CDC report, State Indicator Report on Fruits and Vegetables, states that 37.7% and 22.6% adults in the U.S. have a consumption of less than 1 time per day of fruits and vegetables, respectively (McGuire, 2013). These rates are far away from the recommended intake according to the Dietary Guidelines for Americans 2015-2020 and advocate a great deal of effort in the promotion of fruit and vegetables and increasing their consumption. This need for improvement applies to all adults, including South Asians, in regards to the intake of fruits and vegetables as indicated by the results of this study and requires programs focused on increasing consumption of F/V.

One of the areas of focus for this current nutrition program was on increasing the consumption of fruits and vegetables. Though there was no significant increase in the fruit or vegetable intake after the intervention, there were significant improvements in perceived behavioral control in the form of confidence towards consuming F/V and improved healthy eating strategies. Also, intention to consume more fruits and vegetables was strongly associated with increased fruit intake. Studies have shown that

perceived behavioral control or the ability to carry out a certain task is associated with intention to carry out the behavior and eventually behavior. Perceived behavioral control is considered somewhat alike to Bandura's self-efficacy (Ajzen, 2002). Self-efficacy has been shown to be positively related to healthy eating behaviors (Fitzgerald et al., 2013 and Lubans et al., 2012). Particularly, a study by Kothe and Butow utilized an intervention based on theory of planned behavior in the promotion of fruit and vegetable consumption and found an increase in the fruit and vegetable consumption along with improvements in intention, perceived behavioral control, attitudes, and subjective norms (Kothe and Butow, 2012). Hence utilizing psychological methods to improve self-efficacy factors may be beneficial for health and nutrition experts to have a positive impact on behavior (Ashford et al., 2010).

Another finding of this study was that the majority (64%) of the participants were trying to lose weight also. This nutrition education program had one of the lesson sub-areas focused on weight management and physical activity as previous needs assessment also showed that weight management is one of the motivators for adopting a healthier eating pattern in South Asians. This aligns in with their higher BMI of $24.15 \pm 3.69 \text{ kg/m}^2$ which falls under the overweight category for Asians according to the lower cut-offs for BMI for Asians (Iliodromiti et al., 2016) . Though there was no change in self-reported weight post-intervention, but weight description was found to be positively and significantly associated with higher vegetable intake. This is in accordance with previous research in which it was determined that those with higher BMI had better dietary behaviors, which included fruit and vegetable consumption (Qamar, 2012). This could

possibly be because of enhanced awareness of the relationship between weight and its association with health conditions and indicates increased efforts towards healthful diet. Additionally, long-term interventions are may be needed for weight and BMI change to occur over a period of time.

During baseline, about 56.63% participants indicated that they tend to eat the same type of fruits and vegetables all year around. This current program also focused on increasing the consumption of a variety of local and seasonal fruits and vegetables but no change was detected if the participants eat the same kinds of fruits and vegetables all year or they eat what is in season. An implication for future nutrition education programs for South Asians can emphasize on the importance for consuming local and seasonal produce as consuming more seasonal produce can decrease environmental impact of diet and can be a way towards better sustainable consumption patterns (MacDiarmid, 2014).

About a third of South Asians are vegetarians (Jaacks et al., 2016). This study also had 39% participants who considered themselves vegetarians which makes it roughly a third of the sample. Specifically for people of Indian background, faith-based vegetarianism is common and about 40% of the population tend to be vegetarians as reported by the FAO.(Singh et al., 2014) .It is important to keep in mind that there exists a difference between reasons for individuals in the U.S and in South Asia for being vegetarianism and avoid meat and poultry (Ruby et al., 2013). In contrast to the faith-based vegetarianism for Indians, people in the U.S. generally chose a vegetarian lifestyle later in life and consideration of factors such as personal health, animal welfare and environmental sustainability come into play in their decisions (Ruby, 2012).

Vegetarianism may not translate into the healthfulness of a diet. This can be shown by the nutrition transition for Asian Indian vegetarians in which fast foods/snacks, refined carbohydrates and processed/fried foods are replacing whole plant food (vegetables, fruits, nuts etc.) while still maintaining the vegetarian dietary pattern. Also, the trend was leaning towards using cooking oils with more atherogenic effects compared to other oils (Singh et al., 2014). Furthermore, a study conducted by Gadgil et al. (MASALA study which stands for Metabolic syndrome and Atherosclerosis in South Asians Living in America) identified two unique dietary patterns for Asian Indians living in the U.S. These patterns were “Western” and “Vegetarian” where both diets were related with adverse health conditions emphasizing again that just excluding meat-based products may not necessarily mean healthy (Gadgil et al., 2014). Though there exists a high level of vegetarianism but these dietary transition factors are causing an increased risk of non-communicable diseases in this population. Hence, Singh et al. also suggest conducting nutrition interventions that focus on obesity and non-communicable prevention efforts (Singh et al., 2014).

Another result of this study was a significant improvement in the healthy eating strategies post-intervention. Improvement in healthy eating is important because in the U.S., chronic diseases and diet-related conditions such as obesity, type II diabetes, heart disease, and cancer, among other conditions are the prominent causes of disability and death for the majority population (Center for Disease Control and Prevention, 2016a). In fact, one in four adults are affected by multiple chronic health conditions (Ward et al., 2014). These chronic conditions and diseases are a linked to unhealthy behaviors such as

poor nutrition, lack of physical activity, tobacco use and excessive consumption of alcohol. In terms of physical activity, about 80% of South Asian participants indicated partaking in moderate intensity physical activity in the past month for about 3 days/week. It has been reported by the CDC that about half the adult population (52%) did not meet the suggested guidelines for physical activity in 2011. Physical Activity guidelines suggest doing 150 minutes of moderate-intensity aerobic physical activity every week for better health (Office of Disease Prevention and Health Promotion, 2016). Though there was no significant change in physical activity post-program but there was a slight improvement in physical activity after the program.

Not only are these diet-related disease conditions have a toll on the population health, but also they are associated with costly medical procedures. In 2010, 86% of all health care cost expenditure was on people with one or more chronic health conditions according to the CDC report on chronic conditions. Particularly in South Asians who are at an increased risk for diabetes and heart disease, the total estimated cost of diagnosed diabetes was \$245 billion dollars in 2012. The costs associated with cardiovascular disease and stroke were estimated to be \$316.6 billion for 2011 to 2012 (Mozaffarian et al., 2016). Keeping these costs and the health of population in mind, it is crucial for individuals to move towards healthy behaviors in order to reduce their risks for these chronic conditions. Hence, there is an increased emphasis on developing population wide-range dietary interventions which aim to reduce the disease risk factors through the promotion of healthy eating behaviors (McGill et al., 2015).

This current study also looked at the fruit and vegetable shopping practices participants. The mean shopping score was 21.52 ± 5.35 (mean \pm SD) out of 35 suggesting improvement in the healthy shopping practices. Higher score indicates better shopping practices. Research needs to be conducted on shopping behaviors of South Asians and how these can be directed towards healthier purchasing. One of the primary causes for disability and death in the U.S. is poor diet quality which is signified by insufficient consumption of fruits, vegetables, nuts/seeds, whole grains and seafood along with high consumption of sodium. When assessing the costs of a healthful vs unhealthful diet pattern, it has been observed that a healthful pattern cost around \$1.50/day more in comparison to a unhealthful pattern (Mozaffarian et al., 2016). Because of these statistics and in improving the health of the nation, it also becomes important for nutrition educators to guide individuals in shopping for a healthy dietary pattern in a more affordable manner. In order to guide the shopping behavior, it is important to understand the frequency of healthy buying behavior. When conducting a price and calorie comparison of 20 common fruits and vegetables vs. 20 common snack foods such as chips, crackers, pastries and cookies, the American Heart Association estimates that the average cost and calorie per portion comes out to be 31 cents and 57 calories for fruits and vegetables and 33 cents and 183 calories per portion of the snack foods (Mozaffarian et al., 2016). These health related behaviors can be changed with proper guidance and education and in turn, a healthy behavior may reduce the risk associated with these chronic conditions.

Another finding of the study was that majority (63.3%) of the participants lacked knowledge about the recommended intake of fruits and vegetables despite high level of education for the participants. These findings were similar to a U.S. study in which less than one third of participants had knowledge about caloric recommendations (Elbel, 2011). This suggests that higher education and knowledge may not translate into healthier behaviors. In a similar Canadian study, less than one in four participants had the knowledge about the caloric recommendations suggesting a need for longitudinal studies investigating the impact of knowledge and education on utilizing nutrition information and long-term health consequences (McCrary et al., 2016). For the current project, only 25% of the sample had less than or equal to high school education or some college whereas rest of the sample had higher education. In the literature, several studies have reported increased understanding and knowledge of nutrition recommendations for those with higher level of education along with socioeconomic status and higher level of employment (Hendrie et al., 2008, Sinclair et al., 2013, De Vriendt et al., 2009, and Rothman et al., 2006). However, in this study, those who possessed higher knowledge about the fruit and vegetables recommendations in this study also had significantly greater intake of vegetables when relationship between pre-test factors was measured. Research has also shown positive relationship between nutrition knowledge and healthy eating behaviors (Laz et al., 2015, Wardle et al., 2000, Resnicow et al., 2001, Brinberg et al., 2000, Arnold and Sobal, 2000, and Elder et al., 2000).

In regards to the evaluation of the program, a majority (92%) of the sample found the online program to be useful. About 88% of the participants reported that they would

recommend the program to family and friends. This can be an important factor for future programs in utilizing snowball sampling for recruitment. Also, around 90% of the participants indicated that the educational materials helped them in increasing their knowledge about general nutrition and healthy eating. Similarly, a majority (about 59%) of the participants favored the online/web-based format when asked about method of delivery for future nutrition education. With the current advances in technology, new methods of delivering nutrition education are being discovered and implemented. Research has shown that multimedia devices can be appealing, adaptive and economical tools for the delivery of education and health programs to general population (Turnin et al., 2016).

Limitations

Though this was one of the first studies on nutrition education programs for South Asians, the study had its own set of limitations. Firstly, the intake data was self-reported which may create a possibility of bias and the responses may have been inclined towards the favorable answer choices. Research has shown that respondents are more likely to over-report healthy dietary behaviors and height and under-report weight in particular when asked by an interviewer, giving rise to the social desirability bias (Van de Mortel, 2008, and Larson, 2000). Secondly, no incentives were given to the individuals for participating in the program because of lack of funding and may have contributed to the retention rate of about 63%. Research by Lam et al. conducted a literature review of how to successfully recruit young adults for healthy lifestyle

programs. Some of the recommendations are to use formative research to guide recruitment tactics for interventions, provide incentives and use marketing approaches (Lam et al., 2016). Thirdly, this was an online program which required a basic knowledge of technology, it may have attracted more tech-savvy and health-conscious individuals. Additionally, there was no follow-up survey to determine the long-term maintenance of the behaviors and other associated factors. Hence caution should be exercised when generalizing these findings of a short-term online nutrition education program.

Strengths

This study was one of the preliminary prevention and nutrition education programs developed for South Asians in the U.S. Another strength was the use of theory to develop the program as theory-based programs are found to be more effective. Various psychosocial mediators of healthy eating behaviors were measured which gives an insight into how future programs can be developed for fruitful results. Another unique factor of the program is that it looked at the shopping behaviors of South Asians in regards to fruit and vegetables. In terms of recruitment and delivery, the program was delivered through the internet which has the potential to reach South Asians living in various parts of the U.S. Additionally, the online delivery also suggests that the participants could pace themselves accordingly depending on their schedules as one week was given for each lesson.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

An online nutrition education program was developed for South Asians living in the U.S. This program followed the DESIGN model of nutrition education and used survey methodology to determine the behavioral, normative and control beliefs related to healthy eating in South Asians. The program was based on the needs assessment which calculated the nutrition and health related issues in this population. These concerns were related to factors associated with disease prevention such as the fruit and vegetable intake, weight management, label reading, and physical activity. Theory of Planned Behavior was used as the theoretical background for the program and the pre-post survey instruments were developed from questions from validated surveys (Food Attitudes and Behavior (FAB) survey by National Cancer Institute (NCI), psychosocial scales relating to F/V and healthy eating developed by Norman and colleagues (Norman et al., 2010) and F/V shopping practice scale developed by Baranowski and colleagues (Baranowski et al., 2006). Statistical analyses such as independent t-tests and regression analyses were conducted to determine changes in health behaviors and constructs of the theory before and after the program. Regression Analysis were also conducted to see if a relationship existed between sociodemographic, behavioral and theoretical constructs variables. In addition, basic descriptive stats were used for the demographic variables. The effectiveness of the program was determined by the evaluation questions which were

pre-tested. For the pre-test, 166 South Asian participants completed the survey out of which 66 signed up to participate in the program. The mean age for the participants was 27.42 ± 7.41 years. It was a highly educated sample with only about 29% of the participants having less than a college degree whereas rest of the participants possessed a Bachelor's degree or higher. Mean BMI in this sample was 24.15 ± 3.69 which puts this group at in the overweight category for Asians. In regards to the change in behavior and mediators of behaviors, there were some significant post-test changes that were observed after the program. These included increased perceived behavior control (Confidence) towards consuming fruit and vegetables, increased healthy eating behaviors and reduced consumption of fast food. The program was found helpful by a great majority of the participants (92%). In relation to the mediators of the behavior, intention was found to be significantly associated with increased fruit intake and showed that people who intended to consume fruit and vegetables had a higher fruit intake.

Conclusions

This theory-based nutrition education program was effective in improving some of the beliefs and behaviors related to healthy eating. No other program has used the Theory of Planned Behavior to develop a nutrition education program for South Asians. Future work should focus on the development of a large-scale population study which focus on the prevention of diseases and promotion of healthy eating habits while taking into consideration the particular cultural and dietary patterns of South Asians in the U.S. Also, such studies should include follow-up methods in order to determine the long-term

effects of the intervention. Efforts should be taken into consideration in providing incentives for participants as it has been shown to be an effective retention strategy. Additionally, there is work being done on the disaggregation of Asian health data which can prove very helpful in dissecting the particular issues of each Asian sub-group. This undertaken work can also guide the health and nutrition professionals who are working with the South Asian population. There are a lot more efforts that need to be implemented in regards to the the South Asian nutrition. One of these efforts should focus on the local and seasonal consumption of fruits and vegetables to consume more fresh and affordable produce and to aid with sustainability efforts. In conclusion, the South Asian population has its unique set of issues and challenges and this project was just one step in closing the gap that exists in the literature for South Asian nutrition and health behaviors.

REFERENCES

- Ahmed, S. & Lemkau, J. (2000). Cultural issues in the primary care of South Asians. *Journal of Immigrant Health*, 2(2), 89-96.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32(4), 665-683.
- American Heart Association. (n.d.). *Weight management quiz*. Retrieved from <https://media.heart.org/fc/quiz/index-3.html?xmlHash=a36762ab6684cbd6d576062f8594a1d5>
- American Heart Association. (2014). *Seasons of eating*. Retrieved from http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/SimpleCookingwithHeart/Simple-Cooking-with-Heart-Seasons-of-Eating-Infographic_UCM_468783_SubHomePage.jsp
- American Heart Association. (2016). *Dining out*. Retrieved from http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/DiningOut/Dining-Out_UCM_304183_SubHomePage.jsp
- Arnold, C. G. & Sobal, J. (2000). Food practices and nutrition knowledge after graduation from the Expanded Food and Nutrition Education Program (EFNEP). *Journal of Nutrition Education and Behavior*, 32, 130–138.
- Ashford, S., Edmunds, J., & French, D. P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology*, 15(2), 265-288.
- Baranowski, T, Missaghian, M, Broadfoot, A, Watson, K., Cullen, K., Nicklas, T., Fisher, J., Baranowski, J., & O'Donnell, S. (2006). Fruit and vegetable shopping practices and social support scales: A validation. *Journal of Nutrition Education and Behavior*, 38(6). 340-351.
- Barer-Stein, T. (1999). *You Eat What You Are: People, Culture and Food Traditions*. (2nd ed.) pp.201-214. Richmond Hill, Ontario, Canada: Firefly Books.
- Bharmal, N., Kaplan, R. M., Shapiro, M. F., Mangione, C. M., Kagawa-Singer, M., Wong, M. D., & McCarthy, W. J. (2015). The association of duration of residence in the

United States with cardiovascular disease risk factors among South Asian immigrants. *Journal of Immigrant and Minority Health*, 17(3), 781-790. doi:10.1007/s10903-013-9973-7

Bhopal, R., Unwin, N., White, M., Yallop, J., Walker, L., Alberti, K. M., & ... Tavrildou, A. (1999). Heterogeneity of coronary heart disease risk factors in Indian, Pakistani, Bangladeshi, and European origin populations: cross sectional study. *British Medical Journal*, (7204). 215.

Brinberg, D., Axelson, M. L., & Price, S. (2000). Changing food knowledge, food choice, and dietary fiber consumption by using tailored messages. *Appetite*, 35(1), 35–43.

Center for Disease Control and Prevention. (2015). *Physical activity and health*. Retrieved from <http://www.cdc.gov/physicalactivity/everyone/health/index.html#ControlWeight>

Center for Disease Control and Prevention. (2016a). *Chronic Disease Prevention and Health Promotion*. Retrieved from <http://www.cdc.gov/chronicdisease/overview/>

Center for Disease Control and Prevention. (2016b). *My physical activity diary*. Retrieved from http://www.cdc.gov/healthyweight/pdf/physical_activity_diary_cdc.pdf

Chapman, J. (2013). Effectiveness of physical activity and dietary interventions in South Asian populations: A systematic review. *British Journal of General Practice*, 63(607), e104-e114.

Clark-Carter, D. (2004). *Quantitative psychological research: A student's handbook*. New York, NY: Psychology Press.

Contento, I. (2008). Special article: Review of nutrition education research in the Journal of Nutrition Education and Behavior, 1998 to 2007. *Journal of Nutrition Education and Behavior*, 40(3), 331-340. doi:10.1016/j.jneb.2008.06.001

Contento, I. (2011). *Nutrition education: linking research, theory, and practice*. (2nd ed.) Sudbury, MA: Jones and Bartlett Publishers.

De Vriendt, T., Matthys C., Verbeke W., Pynaert, I.,...De Henauw S. (2009). Determinants of nutrition knowledge in young and middle-aged Belgian women and the association with their dietary behaviour. *Appetite*, 52, no. 3(3).

Elbel, B. (2011). Consumer estimation of recommended and actual calories at fast food restaurants. *Obesity*, 19(10), 1971-1978. doi:10.1038/oby.2011.214

Elder, J. P., Candelaria, J. I., Woodruff, S. I., Criqui, M. H., Talavera, G. A., & Rupp, J. W. (2000). Results of language for health: Cardiovascular disease nutrition education for Latino English-as-a-second-language students. *Health Education and Behavior, 27*, 50–63.

Fischbacher, C. M., Hunt, S., & Alexander, L. (2004). How physically active are South Asians in the United Kingdom? A literature review. *Journal of Public Health, 26* (3), 250-258. doi:10.1093/pubmed/fdh158

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York, NY: Psychology Press.

Fitzgerald, A., Heary, C., Kelly, C., Nixon, E., & Shevlin, M. (2013). Self-efficacy for healthy eating and peer support for unhealthy eating are associated with adolescents' food intake patterns. *Appetite, 63*, 48–58.

Gadgil, M. D., Anderson, C. A., Kandula, N. R., & Kanaya, A. M. (2014). Research: Dietary patterns in Asian Indians in the United States: An analysis of the metabolic syndrome and atherosclerosis in South Asians living in America study. *Journal of The Academy of Nutrition and Dietetics, 114*238-243. doi:10.1016/j.jand.2013.09.021

Hajra A., Li, Y., Siu, Stanton., Udaltsova, N., Anne, A., Friedman, G., Klarsky, A. (2013). Risk of coronary disease in the South Asian American population. *Journal of the American College of Cardiology, 62*(7), 644-5

Hendrie, G. A., Coveney, J., & Cox, D. (2008). Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample. *Public Health Nutrition, 11*(12), 1365-1371

Holland, A. T., & Palaniappan, L. P. (2012). Problems with the collection and interpretation of Asian-American health data: omission, aggregation, and extrapolation. *Annals of Epidemiology, 22*(6), 397–405. <http://doi.org/10.1016/j.annepidem.2012.04.001>

Iliodromiti, S., Ghouri, N., Celis-Morales, C. A., Sattar, N., Lumsden, M. A., & Gill, J. R. (2016). Should physical activity recommendations for South Asian adults be ethnicity-specific? Evidence from a cross-sectional study of South Asian and white European men and women. *Plos ONE, 11*(8), 1-10. doi:10.1371/journal.pone.0160024

Jaacks, L. M., Kapoor, D., Singh, K., Narayan, K. V., Ali, M. K., Kadir, M. M., & ... Prabhakaran, D. (2016). Applied nutritional investigation: Vegetarianism and cardiometabolic disease risk factors: Differences between South Asian and US adults. *Nutrition, 32*975-984. doi:10.1016/j.nut.2016.02.011

- Jeanfreau, S. G., & Jack, L. J. (2010). Appraising qualitative research in health education: Guidelines for public health educators. *Health Promotion Practice*, 11(5), 612-617. doi:10.1177/1524839910363537
- Kanaya, A. M., Herrington, D., Vittinghoff, E., Ewing, S. K., Liu, K., Blaha, M. J., & ... Kandula, N. R. (2014). Understanding the high prevalence of diabetes in U.S. South Asians compared with four racial/ethnic groups: the MASALA and MESA studies. *Diabetes Care*, 37(6), 1621-1628. doi:10.2337/dc13-2656
- Kandula, N. R., Patel, Y., Dave, S., Seguil, P., Kumar, S., Baker, D. W., & ... Siddique, J. (2013). The South Asian Heart Lifestyle Intervention (SAHELI) study to improve cardiovascular risk factors in a community setting: Design and methods. *Contemporary Clinical Trials*, 36479-487. doi:10.1016/j.cct.2013.09.007
- Khan, S. A., Jackson, R. T., & Momen, B. (2016). The relationship between diet quality and acculturation of immigrated South Asian American adults and their association with metabolic syndrome. *Plos ONE*, 11(6), 1-12. doi:10.1371/journal.pone.0156851
- Kittler, P. G., & Sucher, K. (2004). *Food and culture*. Belmont, CA: Thomson/Wadsworth Learning.
- Kothe, E.J. (2012). Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour. *Appetite*, 58(3), 997-1004.
- Lagisetty, P., Wen, M., Choi, H., Heisler, M., Kanaya, A., & Kandula, N. (2016). Neighborhood social cohesion and prevalence of hypertension and diabetes in a South Asian population. *Journal of Immigrant and Minority Health*, 18(6), 1309-1316. doi:10.1007/s10903-015-0308-8
- Lam, E., Partridge, S. R., & Allman-Farinelli, M. (2016). Strategies for successful recruitment of young adults to healthy lifestyle programs for the prevention of weight gain: A systematic review. *Obesity Reviews*, 17(2), 178-200. doi:10.1111/obr.12350
- Larson, M. R. (2000). Social desirability and self-reported weight and height. *International Journal of Obesity*, 24(5), 663-665.
- Laz, T., Rahman, M., Pohlmeier, A., & Berenson, A. (2015). Level of nutrition knowledge and its association with weight loss behaviors among low-income reproductive-age women. *Journal of Community Health*, 40(3), 542-548. doi:10.1007/s10900-014-9969-9
- Lihn, A. S., Pedersen, S. B., & Richelsen, B. (2005). Adiponectin: action, regulation and association to insulin sensitivity. *Obesity Reviews*, 6(1), 13-21. doi:10.1111/j.1467-789X.2005.00159.x

- Lin, B. (2016). U.S. food commodity consumption broken down by demographics, 1994-2008. *Economic Research Service*, 206.
- Lubans, D. R., Plotnikoff, R. C., Morgan, P. J., Dewar, D., Costigan, S., & Collins, C. E. (2012). Explaining dietary intake in adolescent girls from disadvantaged secondary schools. A test of Social Cognitive Theory. *Appetite*, 58, 517–24. doi:10.1016/j.appet.2011.12.012
- MacDiarmid, J. (2014). Seasonality and dietary requirements: will eating seasonal food contribute to health and environmental sustainability?. *Proceedings of the Nutrition Society*, 73(3), 368-375.
- Mari-Sanchis, A., Gea, A., Basterra-Gortari, F. J., Martinez-Gonzalez, M. A., Beunza, J. J., & Bes-Rastrollo, M. (2016). Meat consumption and risk of developing type 2 diabetes in the SUN project: A highly educated middle-class population. *Plos ONE*, 11(7), 1-15. doi:10.1371/journal.pone.0157990
- Mathews, G., Alexander, J., Rahemtulla, T., & Bhopal, R. (2007). Impact of a cardiovascular risk control project for South Asians (Khush Dil) on motivation, behaviour, obesity, blood pressure and lipids. *Journal of Public Health*, 29(4), 388-397.
- McCrary, C., Vanderlee, L., White, C. M., Reid, J. L., & Hammond, D. (2016). Knowledge of recommended calorie intake and influence of calories on food selection among Canadians. *Journal of Nutrition Education and Behavior*, 48199-207.e1. doi:10.1016/j.jneb.2015.12.012
- McGill, R., Anwar, E., Orton, L., Bromley, H., Lloyd-Williams, F., O'Flaherty, M., & ... Capewell, S. (2015). Are interventions to promote healthy eating equally effective for all? Systematic review of socioeconomic inequalities in impact. *BMC Public Health*, 15(1), 1-15. doi:10.1186/s12889-015-1781-7
- McGuire, S. (2013). State indicator report on fruits and vegetables, 2013, Center for Disease Control and Prevention, Atlanta, GA. *Advances in Nutrition* (Bethesda, Md.), 4(6), 665-666. doi:10.3945/an.113.004598
- Medical Research Council. (2000). A framework for development and evaluation of RCTs for complex interventions to improve health. London: MRC
- Michie, S., & Abraham, C. (2004). Interventions to change health behaviours: evidence-based or evidence-inspired?. *Psychology & Health*, 19(1), 29-49.
- Misra, A. (2007). The metabolic syndrome in South Asians: Continuing escalation & possible solutions. *Indian Journal of Medical Research*, 125(3), 345-354.

Misra, R. (2010). *Indian Foods: AAPI's guide to nutrition, health and diabetes (2nd Edition)*. Retrieved from https://www.aace.com/sites/all/files/aapi_guide_to_nutrition_health_and_diabetes.pdf

Mozaffarian, D. Benjamin, E.J., Go, A.S., Arnett, D.K., Blaha, M.J.,... Turner, M.B. (2016). Executive summary: Heart disease and stroke statistics--2016 update: A report from the American Heart Association. *Circulation*, 133(4), 447-54.

National Heart, Lung, and Blood Institute. (April, 2015). *Portion Distortion*. Retrieved from <https://www.nhlbi.nih.gov/health/educational/wecan/eat-right/portion-distortion.htm>

National Institute for Health and Clinical Excellence. (2011). Preventing type 2 diabetes: population and community-level interventions in high-risk groups and the general population. *NICE public health guidance* 35. London: DoH.

Neuenschwander, L. M., Abbott, A., & Mobley, A. R. (2013). Research: Comparison of a Web-Based vs in-person nutrition education program for low-income adults. *Journal of the Academy of Nutrition and Dietetics*, 113(12), 120-126. doi:10.1016/j.jand.2012.07.034

Norman, G.J., Carlson, J.A., Sallis, J.F., Wagner, N., Calfas, K.J., & Patrick, K. (2010). Reliability and validity of brief psychosocial measures related to dietary behaviors. *International Journal of Behavioral Nutrition and Physical Activity*, 7, 56.

O'Neal, C. W., Wickrama, K. (. , Ralston, P. A., Ilich, J. Z., Harris, C. M., Coccia, C., & ... Lemacks, J. (2014). Eating behaviors of older African Americans: An application of the Theory of Planned Behavior. *Gerontologist*, 54(2), 211-220.

Office of Disease Prevention and Health Promotion. (January, 2011). *Eat healthy your way*. Retrieved from https://health.gov/dietaryguidelines/workshops/DGA_Workshops_Wkshp_2_handout.pdf

Office of Disease Prevention and Health Promotion. (April, 2012). *Eat healthy. Be Active*. Retrieved from https://health.gov/dietaryguidelines/workshops/DGA_Workshops_Complete.pdf

Office of Disease Prevention and Health Promotion. (2016). *Physical activity guidelines*. Retrieved from <https://health.gov/paguidelines/guidelines/adults.aspx>

Poddar, K. (2010). Web-based nutrition education intervention improves self-efficacy and self-regulation related to increased dairy intake in college students. *Journal of the American Dietetic Association*, 110(11):1723-1727

- Qamar, Z. (2012). *Dietary behaviors and nutrition knowledge among South Asians* (Master's thesis). Texas A&M University. Retrieved from <http://hdl.handle.net/1969.1/ETD-TAMU-2011-12-10576>.
- Raberg Kjollesdal, M. K., Hjellset, V. T., Bjørge, B., Holmboe-Ottesen, G., & Wandel, M. (2011). Perceptions of risk factors for diabetes among Norwegian-Pakistani women participating in a culturally adapted intervention. *Ethnicity & Health, 16*(3), 279-297. doi:10.1080/13557858.2011.57353
- Resnicow, K., Jackson, A., Wang, T., et al. (2001). A motivational interviewing intervention to increase fruit and vegetable intake through black churches: Result of the eat for life trial. *American Journal of Public Health, 91*, 1686–1693.
- Riebl, S. K. (2015). A systematic literature review and meta-analysis: The Theory of Planned Behavior behavior's application to understand and predict nutrition-related behaviors in youth. *Eating Behaviors, 18*, 160-178.
- Rothman, R. L., Housam, R., Weiss, H. et al., (2006). Patient understanding of food labels: The role of literacy and numeracy. *American Journal of Preventive Medicine, 31*(5), 391-398.
- Ruby, M. B. (2012). Vegetarianism. A blossoming field of study. *Appetite, 58*, no. 1(1)
- Ruby, M. B. (2013). Research report: Compassion and contamination. Cultural differences in vegetarianism. *Appetite, 71*, 340-348.
- Rush, E. C., Chandu, V., & Plank, L. D. (2007). Reduction of abdominal fat and chronic disease factors by lifestyle change in migrant Asian Indians older than 50 years. *Asia Pacific Journal of Clinical Nutrition, 16*(4), 671-676.
- Seo, S. (2014). Using the Theory of Planned Behavior to determine factors influencing processed foods consumption behavior. *Nutrition Research and Practice, 8*(3), 327-335.
- Shah, A. D., Kandula, N., Lin, F., Allison, M., Carr, J., Herrington, D., Liu, K., Kanaya, A. (2016). Less favorable body composition and adipokines in South Asians compared with other US ethnic groups: Results from the MASALA and MESA studies. *International Journal of Obesity, 40*(4), 639-645.
- Shah, A., Clayman, M. L., Glass, S., & Kandula, N. R. (2015). Protect Your Heart: A culture-specific multimedia cardiovascular health education program. *Journal of Health Communication, 20*(4), 424-430. doi:10.1080/10810730.2014.965366
- Shah, A., Hernandez, A., Mathur, D., Budoff, M. J., & Kanaya, A. M. (2012). Adipokines and body fat composition in South Asians: results of the Metabolic

- Syndrome and Atherosclerosis in South Asians Living in America (MASALA) study. *International Journal of Obesity*, 36(6), 810-816. doi:10.1038/ijo.2011.167
- Shah, A., & Kanaya, A. M. (2014). Diabetes and associated complications in the South Asian population. *Current Cardiology Reports*, 16(5), 476. doi:10.1007/s11886-014-0476-5
- Sharma, M. (2006). Designing effective health education interventions for preventing obesity in South Asian Americans. *Californian journal of health promotion*, 4(1), 119-128.
- Sinclair, S., Hammond, D., & Goodman, S. (2013). Research Brief: Sociodemographic differences in the comprehension of nutritional labels on food products. *Journal of Nutrition Education and Behavior*, 45767-772. doi:10.1016/j.jneb.2013.04.262
- Singh, P. N., Arthur, K. N., Orlich, M. J., James, W., Purty, A., Job, J. S., & ... Sabaté, J. (2014). Global epidemiology of obesity, vegetarian dietary patterns, and noncommunicable disease in Asian Indians. *American Journal of Clinical Nutrition*, (Supplement 1).
- Sjoberg, S. (2004). Applying the Theory of Planned Behavior to fruit and vegetable consumption by older adults. *Journal of Nutrition for the Elderly*, 23(4), 35-46.
- Spend smart. Eat smart. (2016). Retrieved from Iowa State University Extension and Outreach <https://spendsmart.extension.iastate.edu/>
- Sutter Health Palo Alto Medical Foundation. (2015). *Body size*. Retrieved from <http://www.pamf.org/southasian/healthy/screening/bodysize.html>
- Tang, J. W., Mason, M., Kushner, R. F., Tirodkar, M. A., Khurana, N., & Kandula, N. R. (2012). South Asian American perspectives on overweight, obesity, and the relationship between weight and health. *Preventing Chronic Disease*, 9E107.
- Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., & ... Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC Medical Research Methodology*, 101. doi:10.1186/1471-2288-10-1
- Tillin, T., Hughes, A., Mayet, J., Whincup, P., Sattar, N., Forouhi, N., McKeigue, P., Chatirvedi, N. (2013). The relationship between metabolic risk factors and incident cardiovascular disease in Europeans, South Asians, and African Caribbeans: SABRE (Southall and Brent Revisited)-A prospective population-based study. *Journal of the American College of Cardiology*, 61(17), 1777-1786.

Tirodkar, M., Baker, D., Makoul, G., Khurana, N., Paracha, M., & Kandula, N. (2011). Explanatory models of health and disease among South Asian immigrants in Chicago. *Journal of Immigrant & Minority Health*, 13(2), 385-394. doi:10.1007/s10903-009-9304-1

Turnin, M., Cazals, L., Bolzonella-Pene, C., Fouquet-Martineau, C., Martini, P., Hanaire, H., & ... Tauber, M. (2016). Effect of nutritional intervention on food choices of French students in middle school cafeterias, using an interactive educational software program (Nutri-Advice). *Journal of Nutrition Education and Behavior*, 48(2), 131-137.e1. doi:10.1016/j.jneb.2015.09.011

United States Department of Agriculture. *Shop smart and save*. (2014). Retrieved from http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/SimpleCookingwithHeart/Simple-Cooking-with-Heart-Shopping-on-a-Budget-Infographic_UCM_463770_SubHomePage.jsp

United States Department of Agriculture. (Jan, 2016a). *Tips to help you eat fruits*. Retrieved from <https://www.choosemyplate.gov/fruits-tips>

United States Department of Agriculture. (Jan, 2016b). *Tips to help you eat vegetables*. Retrieved from <https://www.choosemyplate.gov/vegetables-tips>

United States Department of Agriculture. (July, 2016a). *All about the fruit group*. Retrieved from <http://www.choosemyplate.gov/food-groups/fruits-why.html>

United States Department of Agriculture. (July, 2016b). *All about the vegetable group*. Retrieved from <http://www.choosemyplate.gov/food-groups/vegetables-why.html>

United States Department of Agriculture. (July, 2016c). *Myplate daily checklist*. Retrieved from <https://www.choosemyplate.gov/MyPlate-Daily-Checklist>

United States Department of Agriculture. (October, 2016a). *10 tips: Be active adults*. Retrieved from <https://www.choosemyplate.gov/ten-tips-be-active-adults>

United States Department of Agriculture. (October, 2016b). *10 tips: Use SuperTracker your way*. Retrieved from <http://www.choosemyplate.gov/food-groups/downloads/TenTips/DGTipsheet17SuperTracker.pdf>

United States Department of Agriculture. (October, 2016c). *Using Nutrition Facts Panel*. Retrieved from <https://snaped.fns.usda.gov/resource-library/handouts-and-websites/using-nutrition-facts-labels>

- U.S. Census Bureau. (2012). The Asian Population: 2010. <https://www.census.gov/prod/cen2010/briefs/c2010br-11.pdf> (accessed September 2016).
- U.S. Department of Health and Human Services. (n.d.) *Obesity: The little things*. Retrieved from <https://youtube.googleapis.com/v/D--AtATgfyM%26rel=0>
- U.S. Department of Health and Human Services. (2016). *Tips for fresh produce safety*. Retrieved from <https://www.foodsafety.gov/keep/types/fruits/tipsfreshprodsafety.html>
- U.S. Department of Health and Human Services and U.S. Department of Agriculture. (2015). *2015 – 2020 Dietary Guidelines for Americans*. 8th Edition. Retrieved from <https://health.gov/dietaryguidelines/2015/guidelines/>
- U.S. Food and Drug Administration. (November, 2006). *Make your calories count-Use the Nutrition Facts Label for healthy weight management: Size up your serving and calories*. Retrieved from <http://www.accessdata.fda.gov/videos/CFSAN/HWM/hwmsk01.cfm>
- Van de Mortel, T. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing*, 25(4), 40-48.
- Vegetables and Fruits. (2016). Retrieved from Harvard School of Public Health: <http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/vegetables-and-fruits/>
- Ward, B., Schiller, J., & Goodman, R. (2014). Multiple chronic conditions among US adults: A 2012 Update. *Preventing Chronic Disease*, 11, E62.
- Wardle, J., Permenter, K., & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite*, 34, 269–275
- Whittemore, R., Melkus G, Wagner J, et al. (2009). Translating the diabetes prevention program to primary care: A pilot study. *Nursing research*, 58(1), 2-12.
- Williams, J., & Sultan, M. (1999). Evaluation of an Asian women's healthy eating and exercise group. *Journal of Human Nutrition & Dietetics*, 12(suppl.1), 91-98.
- Zendehtalab, H. R. (2014). The effect of intervention based on the Theory of Planned Behavior on improving nutritional behaviors of students. *Journal of Research & Health*, 4(4), 903-910.

APPENDIX A
SURVEY INSTRUMENT

Do you have a South Asian background?

- Yes (1)
- No (2)

Do you currently live in the U.S.?

- Yes (1)
- No (2)

Please provide your email address if you wish to participate in the online nutrition education program.

South Asian background

- Indian (1)
- Pakistani (2)
- Bangladeshi (3)
- Other(please specify) (4) _____

Gender

- Male (1)
- Female (2)

FOR WOMEN ONLY: Are you currently pregnant?

- Yes (1)
- No (2)

What year were you born?

Nationality

- US Citizen (1)
- Indian (2)
- Pakistani (3)
- Bangladeshi (4)
- Other(please specify) (5) _____

What is your current status?

- Single, never married (1)
- Married without children (2)
- Married with children (3)
- Divorced (4)
- Separated (5)
- Widowed (6)
- Living w/ partner (7)

Zipcode

- Please write (1) _____

What is the highest level of education you have completed?

- Less than High School (1)
- High School / GED (2)
- Some College (3)
- 2-year College Degree (4)
- 4-year College Degree (5)
- Masters Degree (6)
- Doctoral Degree (7)
- Professional Degree (JD, MD) (8)

Length of residence in the U.S. (if foreign born)

- Less than 5 years (1)
- 5-10 years (2)
- 10-15 years (3)
- 15-20 years (4)
- more than 20 years (5)

What is the highest level of education your father has completed?

- Less than High School (1)
- High School/GED (2)
- Some college (3)
- 2-year College Degree (4)
- 4-year College Degree (5)
- Masters Degree (6)
- Doctoral Degree (7)
- Professional Degree(JD, MD) (8)

What is the highest level of education your mother has completed?

- Less than High School (1)
- High School/GED (2)
- Some college (3)
- 2-year College Degree (4)
- 4-year College Degree (5)
- Masters Degree (6)
- Doctoral Degree (7)
- Professional Degree (JD, MD) (8)

Fruits and Vegetables: The following statements are different opinions about eating fruits and vegetables. Please rate HOW IMPORTANT each statement is to your decision to eat 5 fruits and vegetables a day.

	Not Important (1)	Slightly Important (2)	Moderately Important (3)	Very Important (4)	Extremely Important (5)
I would have more energy if I ate fruits and vegetables. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It takes too much time to prepare fruits and vegetables. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be doing something good for my body if I ate fruits and vegetables. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would rather eat sweets or high fat snacks than fruits and vegetables. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People close to me would be pleased if I ate fruits and vegetables. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits and vegetables do not satisfy my hunger for very long. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating more fruits and vegetables helps me manage my weight. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fresh fruits and vegetables are too expensive. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HEALTHY EATING: The following are activities, thoughts, and feelings people use to help them change their dietary habits. Think of any similar experiences you may be having or have had in the past month. Then rate **HOW OFTEN** you do each of the following using the scale below:

	Never (1)	Almost Never (2)	Sometimes (3)	Often (4)	Many Times (5)
I look for information about eating healthy foods. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I keep track of what I eat. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find ways to get around the things that get in the way of eating healthy foods. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think about how my surroundings affect foods I eat (surroundings such as fast food restaurants, vending machines, & pre-packaged foods in store). (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I put reminders around my house to eat healthy foods. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I reward myself for eating healthy foods. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do things to make eating healthy foods more enjoyable. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think about the benefits I will get from eating healthy foods. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to think more about benefits of eating healthy foods and less about hassles of eating healthy foods. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I say positive things to myself about eating healthy foods. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I get off track from my healthy eating goals, I tell myself I can start again and get right back on track. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have friend/family member who encourages me to eat healthy foods. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try different kinds of healthy foods so that I have more choices. (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I set goals to eat healthy foods. (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I make back-up plans to be sure I eat healthy foods. (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fruits and Vegetables There are many things that can get in the way of choosing to eat 5 fruits and vegetables each day. Rate HOW CONFIDENT you are that you can do the following using the scale below.

	Not at All Confident (1)	Somewhat Confident (2)	Moderately Confident (3)	Very Confident (4)	Extremely Confident (5)
Eat 5 servings of fruits and vegetables everyday? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drink 100% fruit juice instead of soda or fruit punch? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables for a snack instead of chips or candy? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when eating out at a restaurant? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am upset or having a bad day? (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruits and vegetables when I am at a social event? (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Source: Psychosocial scales relating to F/V and healthy eating developed by Norman and colleagues (Norman et al., 2010)

Fruit and Vegetable Shopping Practices: Read each statement (1-12) and mark the best answer to describe your own shopping habits. How often do you...

	Never (1)	Rarely (2)	Sometimes (3)	Most of the times (4)	All of the Time (5)
1. look in refrigerator/ pantry before you go shopping to see what you need? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. check for vegetables/fruits or 100% juice on sale when you are at the store? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. read label for nutrients? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. use a grocery list when you shop? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. check for vegetables/fruit or 100% juice on sale before going to the store? (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. plan menus for the coming week? (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. use coupons for food? (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Source: Survey adapted from F/V shopping practice scales developed by Baranowski and colleagues (Baranowski et al., 2006)

Food Attitude and Behavior (FAB) Survey:

About how many CUPS of fruits and vegetables does the government recommend that adults should eat each day? (CHOOSE ONLY ONE ANSWER)

- I am really not sure (1)
- Cups per day (2) _____

About how many SERVINGS of fruits and vegetables does the government recommend that adults should eat each day? (CHOOSE ONLY ONE ANSWER)

- I am really not sure (1)
- Servings per day (2) _____

Your Health

In general, would you say your health is

- Excellent (1)
- Very Good (2)
- Good (3)
- Fair (4)
- Poor (5)

What is your height without shoes?

- 4'10" (1)
- 4'11" (2)
- 5' (3)
- 5'1" (4)
- 5'2" (5)
- 5'3" (6)
- 5'4" (7)
- 5'5" (8)
- 5'6" (9)
- 5'7" (10)
- 5'8" (11)
- 5'9" (12)
- 5'10" (13)
- 5'11" (14)
- 6' (15)
- 6'1" (16)
- 6'2" (17)
- 6'3" (18)

What is your weight without shoes (please write in pounds (lbs) e.g. 125)?

How do you describe your weight?

- Very Underweight (1)
- Slightly Underweight (2)
- About The Right Weight (3)
- Slightly Overweight (4)
- Very Overweight (5)

Are you currently trying to gain weight, lose weight, or neither?

- Gain weight (1)
- Lose weight (2)
- Neither of these (3)

How often have you worried about your overall health in the past year?

- Not at all (1)
- A little bit (2)
- Somewhat (3)
- Quite a bit (4)
- All the time (5)

How much has worrying about your health led you to change the way you ate in the past year?

- Not at all (1)
- A little bit (2)
- Somewhat (3)
- Quite a bit (4)
- All the time (5)

WHAT YOU EAT AND DRINK

On average, about how many cups of bottled or tap water do you drink each day? (8 oz. of water is equal to one cup. One standard 16 oz. bottle of water equals 2 cups.)

- None (1)
- 1-3 cups (2)
- 4-7 cups (3)
- 8 or more cups (4)

On average, about how many cups of soda do you drink each day?

- None (1)
- 1-3 cups (2)
- 4-7 cups (3)
- 8 or more cups (4)

On average, about how much Alcohol do you drink each day?

- None (1)
- 1-3 cups (2)
- 4-7 cups (3)
- 8 or more cups (4)

How often do you eat pre-washed/ pre-cut fruits and vegetables such as bags of salad, baby carrots, or cut-up fruit? (DO NOT COUNT FROZEN OR CANNED FRUITS AND VEGETABLES.)

- More than once a week (1)
- Once a week (2)
- Every other week (3)
- Once a month (4)
- Every other month (5)
- 2-3 times a year (6)
- Yearly or not at all (7)
- Don't know (8)

How many times a week do you usually eat a meal from a fast food restaurant like McDonald's, Burger King, Wendy's, Taco Bell, Pizza Hut, etc.? Consider breakfast, lunch, and dinner. (WRITE IN NUMBER)

How many times a week do you eat a meal while watching television? Consider breakfast, lunch, and dinner. (WRITE IN NUMBER)

How many times a week do you eat dinner sitting around a table with family or friends? (WRITE DINNERS/WEEK IN NUMBER)

The next two questions ask about cups of fruits and vegetables. The following boxes provide some examples of how much counts as one cup.

1 cup of fruit could be	1 cup of vegetables could be
1 small apple	3 broccoli spears, 5 in. long
1 large banana	1 cup of cooked leafy greens
1 large orange	2 cups of lettuce or raw greens
8 large strawberries	12 baby carrots
1 medium pear	1 medium potato
2 large plums	1 large sweet potato
32 seedless grapes	1 large ear of corn
1 cup (8 oz.) of 100% juice	1 large raw tomato
½ cup of dried fruit	1 cup of cooked beans
1 small wedge of watermelon (1 inch thick)	2 large celery stalks

About how many cups of FRUIT (including 100% pure fruit juice) do you eat or drink each day?

- None (1)
- ½ to 1 cup (2)
- 2-3 cups (3)
- ½ cup or less (4)
- 1-2 cups (5)
- 3-4 cups (6)
- 4 cups or more (7)

About how many cups of VEGETABLES (including 100% vegetable juice) do you eat or drink each day?

- None (1)
- ½ to 1 cup (2)
- 2-3 cups (3)
- ½ cup or less (4)
- 1-2 cups (5)
- 3-4 cups (6)
- 4 cups or more (7)

Physical Activity

During the past month, did you participate in any physical activities or exercises such as running, basketball, gardening, dancing, or walking for exercise?

- Yes (1)
- No (2)

In a typical week, how many days do you do any physical activity or exercise of at least moderate intensity, such as brisk walking, bicycling at a regular pace, and heavy gardening? Moderate-intensity activities make you breathe somewhat harder than normal

- 1 day/week (1)
- 2 days/week (2)
- 3 days/week (3)
- 4 days/week (4)
- 5 days/week (5)
- 6 days/week (6)
- 7 days/week (7)

On the days that you do any physical activity or exercise of at least moderate intensity, how long are you typically doing these activities?

		Write in Number (1)
Hours (1)		
Minutes (2)		

What you ate LAST month

These questions are about the different kinds of foods you ate or drank during the LAST MONTH. Please include meals and snacks eaten at home, at work or school, in restaurants, or any place else.

During the last month, how often did you drink 100% PURE FRUIT JUICE, such as orange, apple, and grape juices? Do NOT include fruit drinks with added sugar, like Kool-aid, lemonade, Gatorade, fruit punch, and cranberry cocktail.

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you drank 100% fruit juice?

- Did not drink 100% fruit juice in the last month (1)
- Less than $\frac{3}{4}$ cup (less than 6 ounces) (2)
- $\frac{3}{4}$ to 1 $\frac{1}{4}$ cup (6 to 10 ounces) (3)
- 1 $\frac{1}{4}$ to 2 cups (10 to 16 ounces) (4)
- More than 2 cups (more than 16 ounces) (5)

During the last month, how often did you eat FRUIT? Count fresh, frozen, and canned fruit. Do NOT count juices.

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you ate fruit?

- Did not eat fruit in the last month (1)
- Less than $\frac{1}{2}$ cup or less than 1 medium fruit (2)
- About $\frac{1}{2}$ cup or 1 medium fruit (3)
- About 1 cup or 1 large fruit (4)
- More than 1 cup or more than 1 large fruit (5)

During the last month, how often did you eat lettuce or a green, leafy SALAD, with or without other vegetables? (INCLUDE SPINACH SALADS)

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you ate salad?

- Did not eat salad in the last month (1)
- About ½ cup (2)
- About 1 cup (3)
- About 2 cups (4)
- More than 2 cups (5)

During the last month, how often did you eat FRENCH FRIES, home fries, or hash brown potatoes?

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you ate French fries, home fries, or hash brown potatoes?

- Did not eat fried potatoes in the last month (1)
- About 1 cup or less (small order) (2)
- About 1 ½ cups (medium order) (3)
- About 2 cups (large order) (4)
- About 3 cups or more (Super Size order or more) (5)

During the last month, how often did you have other kinds of non-fried POTATOES? Count baked potatoes, boiled potatoes, mashed potatoes, and potato salad. (INCLUDE YAMS, SWEET POTATOES, RED-SKINNED, AND YUKON GOLD POTATOES)

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you ate non-fried potatoes?

- Did not eat potatoes in the last month (1)
- ½ cup or less (1 small potato or less) (2)
- ½ to 1 cup (1 medium potato) (3)
- 1 to 1 ½ cup (1 large potato) (4)
- 1 ½ cups or more (5)

During the last month, how often did you eat COOKED DRIED BEANS, such as refried beans, baked beans, bean soup, and pork and beans? Do NOT include green beans.

- Never (1)
- 1-3 times last month (2)
- 1-2 times per week (3)
- 3-4 times per week (4)
- 5-6 times per week (5)
- 1 time per day (6)
- 2 times per day (7)
- 3 times per day (8)
- 4 times per day (9)
- 5 or more times per day (10)

About how much did you have each time you ate COOKED DRIED BEANS? (last month)

- Did not eat beans in the last month (1)
- Less than ½ cup (2)
- ½ to 1 cup (3)
- 1 to 1½ cup (4)
- More than 1½ cups (5)

Think about the TYPES of fruits and vegetables you eat. Do you tend to eat the same types of fruits and vegetables all year round, or do you tend to eat different types of fruits and vegetables depending on what is “in season”?

- I tend to eat the same types of fruits and vegetables all year round (1)
- I tend to eat different types of fruits and vegetables depending on what is in season (2)

Do you currently consider yourself to be a vegetarian or vegan?

- Yes (1)
- No (2)
- Don't Know (3)

General On average, how many hours of sleep per day do you usually get . . .

	Hours of sleep/day (write in Number) (1)
On a typical weeknight (Sunday - Thursday)? (1)	
On a typical weekend night (Friday or Saturday)? (2)	

IN THE PAST WEEK, how many hours total did you spend using the Internet for personal reasons (not for work)? (ENTER NUMBER OF HOURS IN THE SPACE BELOW. IF YOU DID NOT USE THE INTERNET IN THE PAST WEEK, ENTER “0”.)

	Hours (1)
Number of hours last week (1)	

What is the total number of hours of television you watch...

	Write in Numbers (1)
During an average week (add up Monday through Friday)? (1)	
During an average weekend (add up Saturday and Sunday)? (2)	

Source: Survey adapted from Food attitudes and Behavior (FAB) survey by National Cancer Institute (NCI)

Evaluation Questions:

These questions were used for evaluating the online/web-based nutrition education program for South Asians.

Process Questions:

This web-based nutrition education program was overall helpful.

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)

Which method of delivery would you prefer for future nutrition education?

- Online/Web-based (1)
- Direct Mail (2)
- Face-to face (3)
- Telephone (4)
- Group based (5)
- Other (Please specify) (6) _____

If you have received nutrition knowledge in the past, what was the format through which education was delivered (e.g. from a class, physicians advice, internet etc.)? Please specify

Would you recommend this nutrition education program to your family and friends?

- Yes (1)
- No(Please specify) (2) _____

What recommendations/changes would you suggest for this web-based nutrition education program?

Knowledge Questions:

The educational materials helped in increasing your knowledge about general nutrition and healthy eating.

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)

The educational materials helped in increasing your knowledge about benefits of Physical Activity and weight management.

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)

The educational materials helped in increasing your knowledge about portion control.

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (3)
- Disagree (4)
- Strongly Disagree (5)

Social Norm/Perception Question:

People who are close to me think that it important to have credible nutrition knowledge for the prevention of diseases.

- Strongly Agree (1)
- Agree (2)
- Neither Agree nor Disagree (4)
- Disagree (5)
- Strongly Disagree (6)

Behavioral Intention Questions:

On a scale of 1-10, how likely are you to change your dietary habits after this intervention?

_____ Likely (1)

On a scale of 1-10, how likely are you to improve your dietary habits after this intervention?

_____ Likely (1)

On a scale of 1-10, how likely are you to increase your consumption of F/V after this intervention?

_____ Likely (1)

On a scale of 1-10, how likely are you to increase your physical activity after this intervention?

_____ Likely (1)

On a scale of 1-10, how likely are you to use food labels after this intervention?

_____ Likely (1)

On a scale of 1-10, how likely are you to control your portions after this intervention?

_____ Likely (1)

APPENDIX B

LESSON PLANS

Nutrition education program objectives for all components

Motivational objectives	Action objectives
<p>Enhance awareness/motivation in South Asians about significance of these for a healthy lifestyle:</p> <ul style="list-style-type: none">• Vegetables and fruits intake• Physical Activity(PA)• Weight management• Label reading• Portion Control• Eating out strategies	<p>Facilitate the ability to act (self-efficacy) by presenting opportunities to obtain appropriate nutrition and food knowledge/skills regarding:</p> <ul style="list-style-type: none">• Vegetables and fruits intake• Physical Activity(PA)• Weight management• Label reading• Portion Control• Eating out

Lesson 1: General educational objectives

Educational plan title: Fruits and Vegetables: What you need to know

Mediator (from Step 3)	General educational objectives
Perceived Outcome expectation (perceived benefits)	Determine appreciation and understanding of the significance of consuming a variety of vegetables and fruits
Perceived Outcome expectation (perceived risk)	Evaluate their individual consumption of vegetables and fruits in comparison to recommendations
Perceived Outcome expectation (perceived barriers)	Mention common barriers and provide information to overcome their barriers
Knowledge and skills (action phase)	Determine the understanding of serving sizes and provide resources to guide serving sizes of fruits and vegetables

Lesson 1: matrix format		
Mediator (from Step 3)	Specific educational objectives*	Theory-based strategy** and educational activities, experiences, and/or content
Awareness	Overview of the program Why is Nutrition Education important for South Asians?	<ul style="list-style-type: none"> • Introduction of Program • Health benefits/pros of behavior Provide scientific evidence that eating F/V is good for health
Perceived Outcome expectation(perceived benefits)	Present benefits of Fruits consumption: such as reduced risk of diseases such as cvd and cancer, low in calories helping in weight management, nutrients for optimal health Present benefits of Vegetable consumption: such as reduced risk of diseases such as cvd and cancer, low in calories helping in weight management, nutrients for optimal health	<ul style="list-style-type: none"> • Nutrients in Fruits “All about the fruit group” by United States Department of Agriculture (2016a). http://www.choosemyplate.gov/food-groups/fruits-why.html • Nutrients in Vegetables “All about the vegetable group” by United States Department of Agriculture (2016b). http://www.choosemyplate.gov/food-groups/vegetables-why.html

Perceived Outcome expectation(perceived risk)	Evaluate individual risk of eating few F/V Explain risks to health from eating less fruits Explain risks to health from eating less vegetables	<ul style="list-style-type: none"> • Self-assessment for both F/V (personalizing risks) Make a list of F/V intake and compare with the recommendations in calculator http://www.cdc.gov/nutrition/everyone/fruitsvegetables/howmany.html • Describe to participants the relationship between Diseases and Fruits/Vegetables http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/vegetables-and-fruits/ • Health benefits of Fruits(heading) http://www.choosemyplate.gov/food-groups/fruits-why.html • Health Benefits of Vegetables(heading) http://www.choosemyplate.gov/food-groups/vegetables-why.html
Perceived Outcome expectation(perceived barriers/self-efficacy)	Explain ways in which fruits can be incorporated in daily diet and easy to eat: mentioning common barriers and ways to overcome them Explain ways in which vegetables can be incorporated in daily diet and easy to eat: mentioning common barriers and ways to overcome them	<ul style="list-style-type: none"> • Make Fruit More Appealing “Tips to help you eat fruits.” By United States Department of Agriculture (2016a) https://www.choosemyplate.gov/fruits-tips • Make Vegetables More Appealing “Tips to help you eat vegetables” by United States Department of Agriculture (2016b). https://www.choosemyplate.gov/vegetables-tips
Food and nutrition related knowledge (action phase)	Explain Myplate* Describe serving sizes for fruits Describe serving size for vegetables	<ul style="list-style-type: none"> • MyPlate graphic for F/V • How much fruit is needed? https://www.choosemyplate.gov/fruit • What counts as a cup of fruit? https://www.choosemyplate.gov/fruit • How many vegetables are needed? https://www.choosemyplate.gov/vegetables • What counts as a cup of vegetables? https://www.choosemyplate.gov/vegetables
Food and nutrition related skills	Demonstration of serving sizes	Describe the serving size of the fruits and vegetables

Lesson 1: Educational plan

Overview:

Introduction: overview and gain attention

Present benefits of eating F/V (knowledge as motivators/pros): emphasize the

importance of F/V and the benefits associated with F/V intake
Evaluation of F/V intake: Comparison of individual fruits/vegetables intake and compare with the recommendations from the calculator
Mention common Barriers and dealing with setbacks
Present information about Serving sizes/Choose my plate recommendations
Demonstration of serving sizes of F/V

Materials:

Webpages

Links

Fruits/Vegetable calculator based on age/gender and physical activity

Infographics

Worksheets

Procedure:

Introduction: (Increase Awareness)

Explain the reason behind doing this project. Show stats of why SA are at higher risk and increase importance and awareness about the problem.

<http://www.pamf.org/southasian/risk/yourrisk.html>

Benefits of F/V: (Perceived Benefits)

Use the links to mention the health benefits of F/V. Describe the reduced risk of diseases with incorporation of F/V. Talk about the nutrients present in F/V and how they contribute to health.

Evaluation/Self-assessment of intake (Perceived risk)

Prompt the users to write down their intake of fruits and vegetables. Then mention to compare them with the recommended values as shown by the calculator.

Barriers to eating F/V: make it easy to incorporate F/V in daily diet (Perceived barriers)

Mention common barriers e.g. lack of time, F/V not tasting good, etc. Can use barriers from needs assessment and show ways to overcome these barriers. Use the links to show how foods and vegetables can be easily incorporated in diet.

Serving sizes/Choose my plate recommendations (Knowledge and skills)

Introduce MyPlate by sharing the information from the links and present recommendations. Describe portion sizes as they relate to fruits and vegetables. Also mention what constitutes a cup of F/V.

Summary/review

Pros/cons of adding F/V to your diet (benefits vs barriers) and serving size

Lesson 2: General educational objectives

Educational plan title: Lesson plan 2: Smart shopping and storage for F/V

Mediator (from Step 3)	General educational objectives
Self-efficacy	Demonstrate improved self-efficacy in incorporating F/V in everyday diet
Knowledge and skills	Demonstrate improved knowledge and skills in shopping smart for F/V
Goal-setting skills	Prepare action plans utilizing goal setting and decision making skills to improve their intake of F/V

Lesson 2: Designing the educational plan: matrix format

Mediator (from Step 3)	Specific educational objectives*	Theory-based strategy** and educational activities, experiences, and/or content
Introduction/Review/Previous Goal		
Food and nutrition related knowledge	State the fundamental reasons for the consumption of a variety of F/V	<p>How-to-knowledge:</p> <ul style="list-style-type: none"> Review reasons for the consumption of a variety of F/V: essential nutrients in them, health benefits and the importance of variety of F/V: Describe Dietary guidelines recommendations: Myplate
Food and nutrition related Skills(Shop smart)	<p>Explain how to shop smarter for healthy eating</p> <p>Explain how to eat healthy on a budget by buying seasonal produce</p>	<ul style="list-style-type: none"> Describe how participants can shop smarter by planning ahead using grocery lists, checking their pantry, saving receipts and coupons and how they can be shop savvy at the store by buying seasonal products and buying in bulk etc. “Shop smart and Save” infographic by United States Department of Agriculture (2014). http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/SimpleCookingwithHeart/Simple-Cooking-with-Heart-Shopping-on-a-Budget-Infographic_UCM_463770_SubHomePage.jsp Demonstrate that by buying seasonal produce, one can get better tasting F/V along with saving some money “Seasons of eating” Infographic by American Heart Association (2014) http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/SimpleCookingwithHeart/Simple-Cooking-with-Heart-Seasons-of-Eating-Infographic_UCM_468783_SubHomePage.jsp

Self-Efficacy	Self-assessment of their knowledge of shopping for F/V in order to have them incorporate F/V in daily lives	<ul style="list-style-type: none"> Prompt the participants to complete the F/V component of the quiz to test their shopping smart knowledge. “Spend smart. Eat smart.” (2016) from Iowa State University Extension and Outreach https://spendsmart.extension.iastate.edu/
Food and nutrition related Skills(Storage)	Explain how to store F/V properly	<ul style="list-style-type: none"> Video-Provide information about proper storage of F/V http://www.foodsafety.gov/keep/types/fruits/tipsfreshprodsafety.html OR https://www.youtube.com/watch?v=WbhudxB3W-M Prompt the user to write down some of their food storage behaviors and compare them with recommendations
Goal-setting	State clear individual action goals to increase intake of F/V Create an action plan to increase the consumption of colorful F/V for the week	<p>Personal action goals</p> <ul style="list-style-type: none"> Demonstrate skills in goal setting and in creating action plans to accomplish individual action goals (worksheet) Creating an action plan worksheet to include different colorful F/V during the week. “Myplate daily checklist” by United States Department of Agriculture (2016c). https://www.choosemyplate.gov/MyPlate-Daily-Checklist (on this website, the link directs to individualized food plan by information entered and meal tracking worksheet by calories)

Lesson 2: Educational plan

Lesson 2:

Overview:

Review/Summary of the previous lesson

Describe smart shopping practices in relation to F/V

Explain proper storage of F/V after being bought

Demonstrate how F/V can be incorporated in diet (Snacks(fruits/veg)/healthy snacking (Meals having vegs/adding veg/fruit to meals))

Describe goal-setting and prompt them to create a personal goal plan in terms of F/V

Materials:

Webpages

Links

Fruits/Vegetable calculator based on age/gender and physical activity

Infographics

Video

Procedure:

Review:

Go over the summary from last lesson.

Shop smart :(Knowledge and skills)

Describe how participants can shop smarter by planning ahead using grocery lists, checking their pantry, saving receipts and coupons and how they can be shop savvy at the store by buying seasonal products and buying in bulk etc. Share the infographic on the website.

Seasonal Produce (Perceived benefits): Demonstrate that by buying seasonal produce, one can get better tasting F/V along with saving some money(Infographic)

Interactive quiz (Self-efficacy): Prompt the participants to complete the F/V component of the quiz to test their shopping smart knowledge.

Proper Storage of F/V: (Knowledge and skills)

Demonstrate how to adequately store F/V by showing a video. Prompt the user to write down some of their food storage behaviors and compare them with recommendations from the point of view of conserving more nutrients in F/V.

Goal setting for F/V:

Demonstrate skills in goal setting and in creating action plans to accomplish individual action goals by asking the participants to fill out forms.

Creating an action plan worksheet to include different colorful, seasonal F/V for the week

(on this website, the link directs to individualized food plan by info entered and meal tracking worksheet by calories)

Lesson 3: General educational objectives

Educational plan title: Get Moving to get to your desired weight

Write the general educational objectives

Mediator (from Step 3)	General educational objectives
Perceived Outcome expectation (perceived benefits)	Determine appreciation and understanding of the significance of PA

Perceived Outcome expectation (perceived risk)	Evaluate their individual weight/assess physical activity in comparison to recommendations
Perceived Outcome expectation (perceived barriers)	Mention common barriers and provide information about PA to overcome their barriers
Knowledge and skills (action phase)	Determine understanding of PA and the related health benefits and how to incorporate in daily life
Goal Setting	Prepare action plans utilizing goal setting and decision making skills to incorporate PA

Lesson 3: Designing the educational plan: matrix format		
Mediator (from Step 3)	Specific educational objectives*	Theory-based strategy** and educational activities, experiences, and/or content
Awareness	Show video to increase awareness about obesity and weight management	Introduction and “Obesity: The little things” by U.S. Department of Health and Human Services (n.d.). https://youtube.googleapis.com/v/D--AtATgfyM%26rel=0
Perceived Outcome expectation (perceived benefits)	Show benefits of PA e.g. reduced risk of diseases, weight management, strengthen bones, longevity etc.	Benefits of PA- Physical activity and health from Center for Disease Control and Prevention (2015) http://www.cdc.gov/physicalactivity/everyone/health/index.html#ControlWeight
Perceived Outcome expectation (perceived risk)	Evaluate individual risk of unhealthy weight using BMI calculator	Prompt the users to calculate their BMI using SA specific BMI calculator and compare that with recommendations. Information taken from “Body Size” by Sutter Health Palo Alto Medical Foundation. (2015) http://www.pamf.org/southasian/healthy/screening/bodysize.html
Knowledge and skills (action phase)	Provide tips to be active adults (through infographic) Prompt users to attempt the quiz	How to be active adults (PDF) “10 tips: Be active adults” by United States Department of Agriculture. (2016a). https://www.choosemyplate.gov/ten-tips-be-active-adults Guide the participants to complete the interactive quiz to determine their knowledge related to weight management Activity: Weight management quiz by American Heart Association https://media.heart.org/fc/quiz/index-3.html?xmlHash=a36762ab6684cbd6d576062f8594a1d5
Goal Setting	State clear individual action goals and create an action	Prompt users to work on the PA diary to create personal goals and ways to stick to these goals PA diary worksheet- My physical activity diary from Center for Disease Control

	plan for PA activity in relation to weight management	and Prevention (2016b) http://www.cdc.gov/healthyweight/pdf/physical_activity_diary_cdc.pdf
Self-regulation skills	Advise participants to track their PA using the diary and the Supertracker too	Develop ways to track progress. Provide a tool to track PA, diet and weight. Supertracker: The link will guide the participants on how to use the Supertracker tool. Reward self when goal is reached. "10 tips: Use SuperTracker your way" by United States Department of Agriculture (2016b). http://www.choosemyplate.gov/food-groups/downloads/TenTips/DGTipsheet17SuperTracker.pdf

Lesson 3: Educational plan

Overview:

Introduction: Review and Increasing awareness

Benefits of PA

Self-assessment of PA

Time to take action: Goal setting and action plan for PA

Self-monitoring

Materials:

Webpages

Links

Fruits/Vegetable calculator based on age/gender and physical activity

Infographics

Video

Procedure:

Introduction: Review and Increasing awareness (Awareness)

Review last week's lessons and Show video to increase awareness about obesity and weight management

Benefits of PA(Perceived outcomes)

Show benefits of PA e.g. reduced risk of diseases, weight management, strengthen bones, longevity etc.

Self-assessment of PA (Perceived outcomes expectation: perceived risk)

Evaluate individual risk of unhealthy weight using BMI calculator. Prompt the users to fill out the information needed in the calculator and reflect upon the comparison between

their personal status to the recommendations.

How to be Active adults (Knowledge and skills)

Provide tips to be an active adult through the infographic. Then guide the participants to complete the interactive quiz to determine their knowledge related to weight management.

Time to take action: Goal setting and action plan for PA (goal setting)

Prompt users to work on the PA diary to create personal goals and ways to stick to these goals.

Self-monitoring and wrap-up(Self-regulation skills)

Show ways to the participants on how to track progress. Provide a tool to track PA, diet and weight. The link will guide the participants on how to use the Supertracker tool. Reward self when goal is reached.

Lesson 4: General educational objectives

Educational plan title: Lesson 4: Healthy eating strategies

Mediator (from Step 3)	General educational objectives
Knowledge and skills (action phase)	Determine understanding of label reading and how reading labels can be helpful in weight management
Self-efficacy	Demonstrate improved self-efficacy in making healthier choices when eating outside and knowledge of portion sizes
Knowledge and skills	Demonstrate how to choose healthy food options when eating outside

Lesson 4: Designing the educational plan: matrix format		
Mediator (from Step 3)	Specific educational objectives*	Theory-based strategy** and educational activities, experiences, and/or content
Knowledge and skills (motivational phase)	K: Determine understanding of label reading and	<ul style="list-style-type: none"> • Describe how food labels can be effectively used for weight management • State what DV means • Through the interactive web link, demonstrate how to read food labels “Make your calories count-Use the Nutrition Facts Label for healthy weight management: Size up your serving and calories” by U.S. Food and Drug

	how reading labels can be helpful in weight management	Administration (2006). http://www.accessdata.fda.gov/videos/CFSAN/HWM/hwmsk01.cfm
Knowledge and skills (action phase)	S:how to use/read labels	<ul style="list-style-type: none"> • Compare the nutrient content of different foods through a quiz • Practice estimating proper serving size from the label • Comparing %DV of different foods http://www.accessdata.fda.gov/videos/CFSAN/HWM/hwmsk01.cfm
Self-efficacy	Demonstrate improved self-efficacy in understanding portion sizes/serving sizes of common fast-food items	<ul style="list-style-type: none"> • Through the interactive quiz, help the participants to practice their skills in determining the portion size of different types of foods and comparing the calorie content • Portion distortion I and II by National Heart, Lung, and Blood Institute (2015). https://www.nhlbi.nih.gov/health/educational/wecan/eat-right/portion-distortion.htm
Knowledge and skills (action phase)	Describe how you can choose healthier options when eating outside	<ul style="list-style-type: none"> • Provide tips on identifying common terms when reading a menu while eating out Tips for Eating Out, General Tips for Healthy Dining Out and Take-Out workshop (59) “<i>Eat healthy. Be Active</i>” by the Office of Disease Prevention and Health Promotion. (2012). http://www.health.gov/dietaryguidelines/workshops/DGA_Workshops_Complete.pdf • Provide tips on identifying healthy food items in different types of restaurant (Tips for Choosing Healthier Foods at Restaurants (60) http://www.health.gov/dietaryguidelines/workshops/DGA_Workshops_Complete.pdf
Behavioral intentions	Evaluate pros and cons of choosing food items when eating outside in relation to overall health Decisional balance: Evaluate the options of actions available and determine pros and cons of chosen action	<ul style="list-style-type: none"> • Allow the participants to complete the worksheet in order to make them understand the importance of choosing healthier food options when eating outside(Worksheet) • Provide tips on how to improve South Asian diet

Additional Resources		<ul style="list-style-type: none"> • Small changes can make a big difference (about eating healthy outside but that is only half page, rest is healthy lunch). “Eat healthy your way”. Office of Disease Prevention and Health Promotion. (2011). http://www.health.gov/dietaryguidelines/workshops/DGA_Workshops_Wkshp_2_handout.pdf • Labels “Nutrition Facts Panel” by United States Department of Agriculture (2016c). http://snap.nal.usda.gov/resource-library/handouts-and-web-sites/using-nutrition-facts-labels • ***Labels and weight management: talks about serving size, calories and %DV http://www.accessdata.fda.gov/videos/CFSAN/HWM/hwmsk01.cfm • “Dining Out” taken from American Heart Association (2016) http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/DiningOut/Dining-Out_UCM_304183_SubHomePage.jsp
----------------------	--	--

Lesson 4: Educational plan

Overview:

Introduction and Review:

Explain how labels are helpful in weight management

Describe how to read labels

Explain how portion sizes have increased and estimating serving sizes/portions

How to choose healthy foods when eating outside

Pros and cons of choosing foods outside in order to make a decision

Wrap-up

Materials:

Webpages

Links

Interactive quizzes/activities

Infographics

Procedure:

Introduction of the Lesson and Label Reading and weight management: (Knowledge and skills)

Through the interactive web link, the participants are able to learn how to properly read labels.

They should also be able to get an understanding of how labels can help in weight management.

They should get an idea about the %DV and how to read labels to determine %DV in different food items.

Estimate of Portion sizes (Self-efficacy)

Prompt the participants to complete the quiz on portion to enhance their understanding of portion sizes/serving sizes of common fast-food.

Choosing healthy foods when eating outside: (Knowledge and skills)

Provide tips on identifying common terms when reading a menu while eating out. Also, provide tips on identifying healthy food items in different types of ethnic restaurants.

Making a decision: Pros and cons of an Action (Behavioral intention)

Allow the participants to understand the importance of choosing healthier food options when eating outside and weigh the pros and cons of their action. Help them understand the decisional balance and how they can choose a certain action among other options available.

Conclusion:

Healthy Eating Tips for South Asians are presented



Why is Nutrition Education important for South Asians?

Weebly website for the program