

Fachbereich Erziehungswissenschaften und Psychologie
der Freie Universität Berlin

**Health behavior change: Using a theory-based nutrition
intervention to improve fruit and vegetable consumption**

Dissertation

zur Erlangung des akademischen Grades

Doktorin der Philosophie

(Dr. Phil.)

Vorgelegt von

Master -Psych. Pimchanok Kreausukon

Berlin, 2011

Tag der Disputation: 11 July 2011

Erstgutachter: Prof. Dr. Ralf Schwarzer

Zweitgutachterin: Prof. Dr. Sonia Lippke

Tag der Disputation: 11 July 2011

TABLE OF CONTENTS

Acknowledgement	VII
Abstract	IX
Zusammenfassung	XI
1. Introduction	1
1.1 Global Health Concern about Fruit and Vegetable Consumption	2
1.2 Current Situation of Fruit and Vegetable Consumption in Thailand	4
1.3 Fruit and Vegetable Consumption in University Students	7
1.4 Nutrition Education in Thailand	9
1.5 Research Questions	12
1.6 Objectives and Hypothesis of this Study	12
1.7 Scope of the Study	14
1.8 Expected Outcome and Benefits	14
2. Theory and Relevant Literature Reviews	15
2.1 Overview of Health Behavior Change	16
2.2 The Health Action Process Approach (HAPA)	18
2.2.1 Self-Efficacy and Phase-Specific Self-Efficacy Beliefs	20
2.2.2 Planning	28
2.2.2.1 Two Sub Constructs of Planning	30
2.2.2.2 Empirical Evidence for Planning in Health Behavior Change	32
2.2.2.3 Planning as a Mediator	34
2.2.3 Empirical Evidence of HAPA	36
2.3 Health Intervention	37
2.3.1 Intervention Development	37
2.3.1.1 Concept of Intervention Mapping	39
2.3.1.2 Intervention Mapping as a Stepwise Approach for Conducting an Intervention	41
2.3.1.3 Empirical Evidence for Intervention Mapping	43
2.4 Related Research about Health Intervention to Promote Fruit and Vegetable Consumption	48
2.5 College Health and Nutrition	49
2.6 Rationale for the Present Study	52
3. Method	55
3.1 Intervention Mapping as a Guideline of Nutrition Intervention	57
3.2 Quantitative Design: Health Status, Health Promoting Behaviors and Nutrition Behaviors of Thai University Students: A Cross Sectional Study	62
3.2.1 Participants	62
3.2.2 Data Collection Procedure	62
3.2.3 Measures	64
3.3 Qualitative Design: Use of Focus Groups to Explore Thai University Students' Perception of Health and Nutrition Behaviors: Implications for Nutrition Intervention	67
3.3.1 Participants	67
3.3.2 Focus Group Procedures	68

3.3.3 Question Guideline	68
3.3.4 Conducting Focus Group Discussions	69
3.3.5 Data Collection	70
3.3.6 Focus Group Discussion Analysis	70
3.4 Conclusion of Two Studies as Input for the Need Assessment	71
3.5 Experimental Design: A Theory-Based Intervention Study	72
3.5.1 Participants	72
3.5.2 Measures	75
3.5.3 Test of Measures Used in Experimental Design	75
3.5.4 Intervention Conditions	78
3.5.5 Major Methods Employed in this Nutrition Intervention	81
3.5.6 Data Collection	82
3.6 Data Analysis	83
4. Results	84
4.1 Result of Quantitative Design from Cross Sectional Study	85
4.1.1 Descriptive Statistics	86
4.1.2 Intercorrelational Relationships	89
4.1.3 Moderated Mediation Analysis	90
4.2 Result of Qualitative Design from Focus Group Discussions	91
4.2.1 Participants Characteristics	91
4.2.2 Perceptions of Health Behaviors	91
4.2.3 Nutrition Behaviors	93
4.2.4 Barriers to Healthy Eating	97
4.2.5 Need for Nutrition Intervention	99
4.2.6 Types of Nutrition Intervention Preferred	100
4.3 Result of Experimental Design	100
4.3.1 Changes in Studied Variables	101
4.3.1.1 Results from Repeated Measures ANOVA	105
4.3.1.2 Mediation Analysis	109
5. Discussion	111
5.1 The Participants of This Study	112
5.2 Discussion of the Results	113
5.2.1 Discussion for Objective One	113
5.2.1.1 Discussion for the Finding of Quantitative Design	113
5.2.1.2 Discussion for the Finding of Qualitative Design	114
5.2.1.3 Discussion for the Moderated Mediation Analysis	116
5.2.1.4 Conclusion of Two Studies as Information for Need Assessment for Nutrition Intervention	118
5.2.2 Discussion for Objective Two	120
5.2.3 Discussion for Objective Three	127
5.3 General Discussion	128
5.4 Conclusion and Recommendations for Application of Research Findings	131
5.5 Recommendations for Further Research	133
5.6 Limitations	134
6. References	136

7. Appendix	163
7.1 Appendix A: Instruments Employed in the Experimental design	164
7.2 Appendix B: Examples of Intervention Materials	174
8. Curriculum Vitae	180
9. Erklärung zur Dissertation	183

LIST OF FIGURES

Figure 1	An English Version of Thailand's Nutrition Flag	5
Figure 2	Example of Related Nutrition Campaign Currently Used Under the "No Belly" Program for Preventing Obesity	10
Figure 3	Generic diagram of the Health Action Process Approach	20
Figure 4	Intervention Mapping Frame work	57
Figure 5	General Guideline of Questioning Used in the Focus Group Discussions	69
Figure 6	Study Flowchart with Numbers of Participants Who Attended the Intervention and Control Conditions	74
Figure 7	Matrix of Performance Objectives, Determinants, Change Objectives, Theoretical Methods and Strategies to Be Used In Intervention Group	80
Figure 8	Moderated Mediation Model	90
Figure 9	Students' Perception of Health Behaviors	92
Figure 10	Factors Influencing Students' Food Choices	95
Figure 11	Students' Perceived Meaning of Nutrition Behavior	95
Figure 12	Examples of Healthy and Unhealthy Diets	96
Figure 13	Perceived Barriers to Healthy Eating and Suggestions for Overcoming Barriers	99
Figure 14	Level of Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time	105
Figure 15	Level of Intention of Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time	106
Figure 16	Level of Planning for Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time	107
Figure 17	Level of Perceived Self-Efficacy for Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time	108
Figure 18	Model with Two Mediators (Self-Efficacy and Planning) and Three Covariates (Sex, Body Weight, and Baseline Dietary Behavior)	109

LIST OF TABLES

Table 1	Demographic Information of Participants	63
Table 2	Demographic Characteristics in the Two Experimental Conditions	75
Table 3	Means (M), and Standard Deviations (SD) of all Variables	78
Table 4	Means (M), and Standard Deviations (SD) of all Variables	86
Table 5	Means (M), and Standard Deviations (SD) of HPLP-II Sub Scales	86
Table 6	Means (M), and Standard Deviations (SD) of 52 Items in HPLP-II Sub Scales	87
Table 7	Intercorrelations between Variables	89
Table 8	Means and Standard Deviations (SD) of Fruit and Vegetable Consumption in Both Groups, and Comparison Between Groups	101
Table 9	Means and Standard Deviations (SD) of Intention for Fruit and Vegetable Consumption in Both Groups, and Comparison Between Groups	102
Table 10	Means and Standard Deviations (SD) of Planning for Fruit and Vegetable Consumption in Both Groups, and Comparison Between Groups	103
Table 11	Means and Standard Deviations (SD) Self-Efficacy in Both Groups, and Comparison between Groups	104

Acknowledgement/ Danksagung

I would like to express the depth of my gratitude to the people whose efforts have contributed to this dissertation. The very first person I particularly would like to thank is Prof. Dr. Ralf Schwarzer for giving me such an opportunity to work in this department of Health Psychology where I have learned so many things under friendly and academic environment. Prof. Dr. Schwarzer has taught me a lot of things through his lectures, talk, advices, examples and his manners. I always feel thankful for his kind, helpful and positively encouraging characteristics which inspire me and my future work life for being not just a lecturer but also a good mentor for my students. Without him and his kind help and support, I would have not been here and finished my dissertation.

I am very grateful to Prof. Dr. Sonia Lippke who helps me with my publication article. She also kindly accepted to be my second reviewer for my dissertation. Her help and understanding is very meaningful to me. I would like to express my thankful thoughts to Prof. Dr. Aleksandra Luszczynska and Dr. Nina Knoll for being my committees.

I cordially thank Dr. Lisa Marie Warner so much for being my committee and for helping and encouraging through the years of my working here in Berlin. Her friendly manners and kind advices have always inspired me. I would like to thank Dr. Jana Richert for her motivating and inspiring two seminars I have attended. Her creative teaching, knowledge, thoughtfulness and joyful manner always make the class interesting. I have to say that her first class about "Intervention Mapping and Implementation" has inspired me to design my intervention as a main part of my work.

I am very grateful to my German and foreign colleagues in this department: Dr. Amelie Wiedemann, Dr. Tabea Reuter, Dr. Jochen Ziegelmann, Lena Fleig, Milena Koring, Anna Ernsting, Linda Parschau, Daniela Lange, Sarah Pomp, Carina Küper and Paul Gellert. I especially would like to thank Paul Gellert for his kind help in many things; SPSS, submission of a manuscript and other brilliant advices he always has for me. Thank Dr. Xinfu Yi who always offered help and encouraged me. My thankful thought certainly goes to Dr. Catrinel Craciun, Suhair Hallum, and Dr. Cao Dian Sheng, my office mates. I do thank Diang Sheng so much for his kind help, good stories, laughter and all the snacks and Chinese tea he always shared with me. I really appreciate his thoughtful advices and friendship.

I would really like to thank Mary Wegner for her kind help since my very first days in Berlin. She helped me a lot with my Zulassung, refining my article, making it good to be

submitted for publication. She cannot imagine how her kind smile, birthday hugs, thoughtful help and warm words can always make my days.

I thank all the HIWI staffs especially Genia Juschkevitsch, Jan Keller and Janet Geipel who are always so helpful and so kind whenever I ask for help.

I would really like to express my gratitude to Chiang Mai University and the Faculty of Humanities for providing financial support for me to work and finish my dissertation here. My thankful thought goes to Associate Prof. Rome Chiranukrom, Dean of Faculty of Humanities, for his encouragement and best wishes and for all the food ingredients and Thai snacks he gave me when he visited Berlin last year. I thank my colleagues and administration staffs in my work place, Department of Psychology, Chiang Mai University, for all the help in everything and for facilitating my work whenever I went back to Thailand. I would also like to thank Dr. Somparsong Senarat, whom I have never really met in person, for his help, effort and explanation about mediation analysis whenever I asked for. He confirms my belief in kindness that has to be handed forward without expecting anything in return.

A very special thank to my dear close friend Jantarasub Promkutkeo (Ja), who has been such a great friend in good and bad times for over 15 years. Her kind help, encouragement, strength, and words of wisdom always make things not as hard as they seem to be. My thankful thought also goes to Chatwiboon Peijssel, my long time close friend who always delivers warm encouragement and understanding, Waraluck Puansurin, Ladda Sensuwan and Pornsri Liampongsaputti for their support and help. I also thank Dr. Suranan Noimanee for his help in buying a brand new laptop and for installing all the required programs and all the help he has given me. Also, I thank Thaninrat Thanatarawat for his help in creating an online survey and other technical support.

I also want to thank all of my friends in Berlin, Dr. Sornprarm Vora-urai (Jay), for his help in German teaching and registration, Dr. Sureerat Numeer and Jing for providing accommodation and warm support in Berlin, Dr. Kriangkrai Thongkorn, Dr. Areerath Akatvipat, and Rachot Indradesa, Su, Tong, Nate, Pek for their friendship, help and support. I also thank Herr Frank and Frau Samer Thaldorf for their help and warm support.

I am cordially grateful to my family, my parents and my brother who always love me and take a good care of my cats, my plants and everything at home while I am here. I owe endless gratitude to my husband Dr. Khwanchai Kreausukon for his love and care and endless support with truly understanding.

Abstract

Health behavior change requires more than providing knowledge on how to initiate and adopt changes in target groups. Designing a health intervention needs some conceptual framework to guide the content and strategies used. Moreover, self-regulatory skills are needed for the successful adoption and maintenance of health behaviors.

Many health behavior change approaches share the assumption that the main predictor of health behaviors is the intention. Intention has been regarded as the route of action in terms of direction. However, many people fail to translate intention into action. Individuals are often faced with various obstacles, such as distraction, forgetfulness, temptations, or conflicting bad habits. These are common reasons for failure to change health behaviors. Intentions need to be supplemented by other, more proximal factors that might facilitate the translation of intention into action because changing health behavior involves both motivational and volitional factors and processes. Self-regulatory processes that facilitate behavior change in the face of barriers for action are action planning and coping planning. Along with individuals' perceived self-efficacy which has been found to be important at all stages of health behavior change. Therefore, a nutrition intervention focusing on enhancing self-efficacy and stimulating action planning and coping planning was designed and trialed in this study.

The present study examined the effects of a theory-based intervention with an attempt to explore health behavior change in the context of fruit and vegetable consumption employing the Health Action Process Approach (HAPA) as a theoretical background. A theory-guided health intervention was designed to be used in an experimental study.

A concept of intervention mapping and three methodological designs were used in this study. The quantitative design using a cross-sectional study and the qualitative design using a focus group discussion were used to investigate health promoting behaviors, nutrition practices and the need for an intervention. An experimental design as a health training intervention was employed in the setting of a brief nutrition training course.

Finding has proven the beneficial effects of planning processes to reduce the gap between intention and behavior. A moderating role of self-efficacy was found in a moderated mediation model of the cross-sectional study. Self-efficacy and planning appeared to be mediators for the desired health behavior in the experimental design.

Low consumption of fruit and vegetable in Thailand has become increasing, along with an obesity problem. Effective theory-guided health intervention programs, especially the ones with practical behavioral tools, are needed to help promote desirable nutrition and other health behaviors. The finding of this intervention study underlines the usefulness of implementing planning strategies in health intervention in the future. With a high hope, this study aimed to be a contribution to help strengthening the science of health promotion in Thailand via a practical health behavior change model and strategies which will, in turn, improve health of its people.

ZUSAMMENFASSUNG

Das Verändern von Verhaltensweisen hinsichtlich der Gesundheitspflege bedarf mehr als nur das bloße Bereitstellen von Wissen darüber, wie die Initiation und auch die Übernahme der neuen Verhaltensweisen innerhalb der Zielgruppe funktionieren sollen. Um eine konstruktive Intervention in gesundheitsrelevante Verhaltensweisen zu gewährleisten, muss ein konzeptioneller Rahmen, der den inhaltlichen und strategischen Weg vorgibt, geschaffen werden. Außerdem werden Fähigkeiten zur Selbstregulation für die gelungene Übernahme und Beibehaltung von gesundheitspflegendem Verhalten benötigt.

Viele Ansätze zur Änderung gesundheitsrelevanter Verhaltensmuster teilen die Annahme, dass die Intention als entscheidender Prädiktor für o. g. Verhaltensmuster gelten muss. Intention hier verstanden als gedachter Wegweiser für künftiges Verhalten. Viele Menschen sind jedoch nicht in der Lage, Intention in Handlung „zu übersetzen“. Verschiedene Hinderungsgründe dafür sind u. A. Ablenkung / Zerstreuung, Vergesslichkeit, Verlockungen oder andere konfliktverursachende Verhaltensweisen. Somit muss die Intention durch andere, eher proximale Faktoren, die das Übersetzen von Intention in Aktion unterstützen könnten, ergänzt werden. Denn das Ändern von Verhaltensweisen hinsichtlich der Gesundheitspflege beinhaltet sowohl motivationale als auch volitionale Faktoren und Prozesse. Selbstregulierende Prozesse, die das Ändern von Verhaltensweisen, welches angesichts o. g. Hinderungsgründe oftmals scheitert, unterstützen können, sind das Handlungsplanen und Bewältigungsplanen. Hinzu kommt die, durch das Individuum wahrgenommene, Selbstwirksamkeit, welche für alle Phasen der gesundheitlichen Verhaltensänderungen als wichtig empfunden wird. In der vorliegenden Studie sollte daher eine Ernährungsintervention, mit Fokus auf die Steigerung der

Selbstwirksamkeit und Erarbeitung von Handlungs- und Bewältigungsplanung entwickelt und erprobt werden.

Die hier vorliegende Studie untersuchte die Effekte einer theoriebasierten Ernährungsintervention mit dem Ziel, Verhaltensänderungen hinsichtlich der Gesundheitspflege im Kontext des Obst- und Gemüsekonsums zu entdecken. Als theoretischer Bezugsrahmen gilt hier der „Health Action Process Approach“. Eine theoriegeleitete Gesundheitsintervention wurde für eine experimentelle Studie entwickelt.

Ein Konzept des „Intervention Mapping“ und drei methodologische Designs wurden für diese Studie benutzt. Mit Hilfe des quantitativen Designs, hier als Querschnittsstudie, und des qualitativen Designs, in Form einer Zielgruppendifkussion, konnten gesundheitsfördernde Verhaltensweisen, Ernährungsweisen und die Notwendigkeit für eine Intervention untersucht werden. Das experimentelle Design als Intervention in Form eines Gesundheitstrainings wurde im Rahmen eines kurzen Ernährungstrainingskurses umgesetzt.

Die Ergebnisse der Studie konnten beweisen, dass die Planungsprozesse einen förderlichen Effekt auf die Reduzierung der Lücke zwischen Intention und Verhalten haben. Eine moderierende Rolle der Selbstwirksamkeit konnte in einem moderierten Mediationsmodell innerhalb der Querschnittsstudie festgestellt werden. Selbstwirksamkeit und Planung erschienen als Mediatoren für das angestrebte Gesundheitsverhalten im Experiment.

Der geringe Konsum von Obst und Gemüse hat in Thailand zugenommen, ebenso Probleme mit Übergewicht. Effektive, theoriegeleitete Gesundheitsinterventionsprogramme, speziell solche mit praktischen Verhaltensanweisungen, sind notwendig, um gewünschte Ernährungs- und

gesundheitserhaltende Verhaltensweisen zu fördern. Das Ergebnis der vorliegenden Studie unterstreicht den Nutzen, Planungsstrategien in zukünftige Gesundheitsinterventionsprogramme zu implementieren. Die vorliegende Studie zielte mit großer Hoffnung darauf ab, die wissenschaftliche Gesundheitsförderung in Thailand mittels eines praktischen Modells zur Veränderung gesundheitsrelevanter Verhaltensweisen und Strategien zu stärken, so dass eine Verbesserung der Gesundheit der thailändischen Menschen zu erwarten ist.

Chapter 1

Introduction

1.1 Global Health Concern about Fruit and Vegetable Consumption

Fruits and vegetables are widely accepted as an essential foundation of a healthy diet. Some of the world's most widespread and debilitating nutritional disorders are caused by diets lacking in fiber, vitamins and minerals. High fruit and vegetable consumption is commonly recommended because plant foods contain a high proportion of water, are low in fats, provide high content of fiber and fructose, and are good sources of vitamins and minerals (Pajk, Rezar, Levart, & Salobir, 2006). It was found that increasing one portion of fruit and vegetable a day lowered the risk of coronary heart disease by 4% and the risk of stroke by 6% (Joshiqura et al., 2001). Increase in fruit and vegetable consumption can also lower blood pressure (Appel et al., 1997). It is noted that a sufficient amount of fruit and vegetable consumption is considered to be an active measure to help prevent some chronic diseases and to promote sustainable health and well-being (Ammerman, Lindquist, Lohr, & Hersey, 2002). Healthy nutrition behavior, especially fruit and vegetable consumption, has been regarded as crucial factor in preventing obesity and many diseases. Fruit and vegetables are an important component of a healthy diet and, if consumed daily in sufficient amounts, could help prevent major diseases and certain cancers (Nandi, & Bhattacharjee, 2005). According to *The World Health Report 2002*, low fruit and vegetable intake is estimated to cause about 31% of heart disease, 11% of stroke worldwide (WHO, 2002), and about 19% of gastrointestinal cancer (Lock, Pomerleau, Causer, Altmann, & McKee, 2005). There is also convincing evidence that consumption of fruit and vegetable can promote weight loss (Crujeiras, Parra, Rodriguez, & Martinez de Morentin, 2006) and has been associated with decreased incidence of mortality from a variety of chronic diseases such as cardiovascular diseases, stroke, hypertension, diabetes, obesity (Crujeiras, Goyenechea, & Martinez,

2010), and certain types of cancer (WHO, 2003). They also help prevent constipation by their high-fiber characteristics. There were also large bodies of evidence showing potential benefits of fruit and vegetable consumption to health (Ascherio et al., 1996; Bazzano, 2006; Lampe, 1999; Liu, Manson, Lee, Cole, Henneckens, Willett, & Buring, 2000; Moore et al., 1999). Some papers have shown that diets low in fat, and high in fiber, and high in fruit and vegetable can decrease the risk of colorectal cancer (Campbell et al., 2009) and are most effective against those cancers that involve epithelial cells, such as cancer of the lung, cervix, esophagus, stomach, colon, and pancreas (Ziegler, 1991).

Recommended Amount of Fruit and Vegetable Consumption

Given the mounting evidence suggestive of a potential benefit, recommendations for the consumption of fruits and vegetables have been issued by most national and international health agencies. In dietary guidelines, it should be emphasized that the frequently recommended five servings-per-day should be considered as a minimum. A recently published report of a joint United Nations Food and Agriculture Organization/World Health Organization Expert Consultation on Diet, Nutrition, and the Prevention of Chronic Diseases recommends the consumption of a minimum of 400 grams of fruits and vegetables per day (excluding starchy tubers such as potatoes) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries. This daily recommendation of fruit and vegetable consumption is often phrased as “at least 5 portions/day” based on a typical portion size of 80 g. This is widely accepted internationally (WHO, 2003). Therefore, encouraging people to eat more fruits and vegetables is at the top of nutrition education strategies.

In spite of the growing body of evidence which highlights the protective effect of fruits and vegetables, their consumptions are still inadequate. Guenther, Dodd, Reedy, and Krebs-Smith, (2006) found that only 40% of the US population consumes at least five servings of fruits and vegetables on a daily basis. Below 50% of adolescents and young adults in both genders eat at least five servings of fruit and vegetable per day. Studies of DeBate, Topping, and Sargent (2001) and Lowry, Galuska, Fulton, Wechsler, Kann, and Collings (2000) also found that very few college students in the USA regularly consume at least five servings of fruit and vegetable on a daily basis. There is also the same evidence in many low and middle-income countries. The World Health Survey in 2002-2003 showed that over three-fourth of men and women from 52 low and middle-income countries consumed less than the minimum recommended five daily servings of fruits and vegetables (Hall, 2009). A recent study among five Asian countries showed that inadequate fruit and vegetable consumption was common in all study sites (Kanungsukkasem et al., 2009). Nutrition education and intervention on how to increase fruit and vegetable consumption has become a leading priority (FAO/WHO, 2004). Encouraging people to eat more fruits and vegetables is therefore often at the top of nutrition educators' to-do lists.

1.2 Current Situation of Fruit and Vegetable Consumption in Thailand

In Thailand, a number of dietary recommendations and campaigns with the aim to encouraging its people to eat healthier and consume proper amount of fruit and vegetable have been developed as the Nutrition Flag (Working group on food-based dietary guidelines for Thai people: quantitative process, 2001).



Figure 1 An English Version of Thailand's Nutrition Flag

Thai dietary guidelines (The Thai Nutrition Flag) recommend Thai people to take four to six servings of vegetables and three to four servings of fruits per day. These documents have been employed to encourage individuals to eat healthily. Although there were many efforts to promote healthy eating including fruit and vegetable consumption in proper amount, studies indicate that individual in many age groups fail to adhere to adequate fruit and vegetable consumption. The rapid social change and the opening for westernization occurred during the past decades were associated with changes in diet consumption of individuals. Studies revealed increasing consumption in fast foods, meats products and soft drinks among Thai people (Kosulwat, 2002).

The reports on the 4th National Nutrition Survey in 1995 using a 24-hour dietary recall showed the low level of fruit and vegetable consumption among Thai (MOPH, 1995). In this report, at the household level, more than 106 kinds of various vegetables were consumed by Thais at an average of 113.2 grams per person per day. In terms of fruit consumption, an average of 73.6 grams a day of various fruits, more than 9 kinds, normally in fresh form. Such amounts consumed (combined fruits and vegetables consumed at an average of 186.8 g/day) were considerably low. This amount of consumption was approximately two servings for vegetable and one or two servings of fruit.

Previous research by the Health Information System Development Office (HISO) of Thailand showed that a substantial number of Thai citizens consumed fewer fruits and vegetables than recommended, despite a major government effort launching nutrition messages that focused on the benefits of fruit and vegetable consumption. In every age group, fruit and vegetable consumption was about half of what had been recommended. The results showed that average consumption per day was at 268 grams in men and 283 grams in women (HISO, 2006). The Physical Activity Division, Ministry of Public Health (MOPH, 2000a) investigated health behaviors and physical activity practices among employees of the Ministry of Public Health. Almost half of the participants, especially civil servants with higher education and socioeconomic status, consumed only about two servings of fruit and vegetable per day (or approximately 135 g/day). This was in congruence with research by Satheannopkiao, Aekplakorn, & Pradipasen (2009) in community-dwelling men and women participating in the Thailand National Health Examination Survey III. A recent study of Kanungsukkasem et al. (2009) found that large proportion of adults in Asia, including Thailand, consume an inadequate amount of fruit and vegetable,

despite of the abundant availability. Education and behavior change programmes are needed to promote fruit and vegetable consumption.

1.3 Fruit and Vegetable Consumption in University Students

Adolescents and young people experience dramatic physical growth and development along with psychosocial and cognitive changes during puberty. They also experience significant changes in their ability to assess and comprehend complex situations and information and in their desire to become independent, unique individuals. The increased need for energy and nutrients among adolescents, combined with increasing financial independence, increasing need for autonomy when making food choices, and immature cognitive abilities, places adolescents at nutritional risk (Story & Sang, 2005). Despite the obvious importance of adopting healthful eating practices, college students tend to engage in a number of problematic eating behaviors, including unhealthy dieting, skipping meals, high intake of fast foods, low intake of fruits and vegetables, and minimal consumption of dairy products (Douglas & Collins, 1997; Huang, Harris, Lee, Nazir, Born & Kaur, 2003; Matvienko, Lewis, & Schafer, 2001).

College students, like individuals in other age groups, need varieties of diet. However, college years are a period of significant change in the lifestyle of young adults which may influence dietary behavior of young people. Food patterns established during this time are likely to be maintained for life and may have a long-lasting influence on college students' future health and the health of their future families (Betts, Amos, Keim, Peters, & Stewart, 1997; Brown, Dresen, & Eggett, 2005; Seymour, Hoerr, & Huang, 1997). University students are highly exposed to unhealthy eating habits such as frequent snacking, carbonated drinks taking, high fat

combination dishes intake and less fruit and vegetable consumption (Huang, 1994). These unhealthy diet behaviors are the factors leading to weight gain (Huang, et al., 2003). Some studies showed that college students and young adults aged 18-24 years consume fewer fruit and vegetable than recommended (Chang, Davis, Schwartz, & Tam, 2008; Chung & Hoerr, 2005; DeBate et al., 2001; Li Hui, Hsin Ling, Yin; Richards, Kattelman & Ren, 2006). In a recent study done by Al-Rethaiaa, Fahmy, and Al-Shwaiyat (2010), there was congruent evidence that eating snacks was a common habit among university students while fruits and vegetable were not frequently consumed. Chung and Hoerr (2005) reported that only about 60% of young men met the minimum recommendation of three servings of fruit and vegetable. In line with the finding from the American College Health Association/ National College Health Assessment (NCHA) (2006 see Nelson, 2008) indicate that 93.8% of college students report eating less than the recommended five daily servings of fruits and vegetables, and that 83.3% do not achieve at least 20-30 minutes of moderate to vigorous intensity physical activity on most days of the week. These behaviors may be precursors to long term future weight gain. There are many studies in western countries indicating unhealthy dietary practices, including inadequate fruit and vegetable consumption, among university students (DeBate et al., 2001; Kasperek, Corwin, Valois, Sargent, & Morris, 2008; O'Dea & Abraham, 2002; Racette, Deusinger, Strube, Highstein, & Deusinger, 2008 and 2010; Stock, Wille & Kraemer, 2001;).

In Thailand, although there is no study done in fruit and vegetable consumption among university students, there is evidence as stated earlier that a substantial number of Thai citizens, in every age group, consumed less fruit and vegetable than recommended (HISO, 2006). The report from Thailand Health Profile 2005 to 2007

indicated that Thai teenagers now prefer western foods to local or Thai food. According to the third to fifth national nutrition surveys in Thailand, the prevalence of obesity has been on the rise particularly in the age groups 20-29, 30-39 and 60 and over.

The possible explanation of unhealthy dietary practice among university students is that many of them are occupied with busy lifestyles, spending time in classes, social activities, peer groups, and other irregularly organized activities, and their dietary behaviors are based on rituals, convenience, and social influence. Additionally, young adults have less awareness of the health benefits of fruit and vegetable and the effects of poor dietary practices (Chung, Hoerr, Levine & Coleman, 2006). They are often ambivalent about their future health and the role that nutrition plays.

1.4 Nutrition Education in Thailand

Most of nutrition educations in Thailand are commonly produced as campaigns, especially in printed formats. These campaigns are communication-based interventions aimed at large groups of people. In Thailand, nutrition campaigns have been launched from time to time aiming at general population. The content of these campaigns are mostly concerned with general guidelines for nutrition practices. However, in these recent years, most of health campaigns launched in Thailand have been focusing on obesity prevention campaigns under the English name “No Belly”. As obesity is now becoming a health problem in Thailand (Kantachuvessiri, 2005), these campaigns have been launched by the Bureau of Nutrition (or former “Nutrition division”) of Ministry of Public Health in order to prevent and deal with the obesity problem. These campaigns are generally launched as a package of printed materials

focusing on both nutrition practice following food guideline in Thailand’s nutrition flag, reducing fat and sugar intake, and regular physical activities.



Figure 2 Example of Related Nutrition Campaign Currently Used under the “No Belly” Program for Preventing Obesity

Intervention focuses on fruit and vegetable consumption campaigns alone are available in relatively few numbers and are mostly aimed at young children or specific health problem groups. This is in line with Richards et al. (2006) that there are numerous nutrition education programs promoting fruit and vegetable consumption, but relatively few efforts have targeted college students in these nutrition interventions. Due to the absence of chronic medical conditions in this age group, little attention has been focused on the diets of 18-year-olds to 24-year-olds. In fact, nutrition education efforts should target to college students. An important consideration for health programming is that young adults are a crucial stage in their development as they transition from parental control over lifestyle behaviors to assuming responsibility for their own health choices (Cousineau, Franko, Ciccazzo, Goldstein, & Rosenthal, 2006). A previous study suggests that college students may have minimal knowledge of healthy eating behaviors and nutritional requirements (Matvienko et al, 2001). There was very few nutrition education generally targeted to young people in this setting.

More importantly, most of nutrition education or interventions provided in Thailand were knowledge based campaigns aiming to provide information without specific behavioral strategies to help the target group to perform better in changing their diet behaviors to increase in fruit and vegetable consumption. Finding a way to motivate young adults to consume more fruit and vegetables would represent a solution to avoid the development of body weight problems and chronic illness. Apart from information on health benefits of sufficient fruit and vegetable consumption, behavioral change communication and strategies to promote fruit and vegetable consumption should be included in the health intervention. A review of literature undertaken by Shaikh, Yarooh, Nebeling, Yeh, and Resnicow (2008) indicated that

one of the prominent psychological constructs predicting fruit and vegetable consumption in adult was self-efficacy. Meanwhile, behavioral tool such as implementation intention or planning has been found to facilitate behavior change; people are more likely to act upon their intentions when generating such a plan (Gollwitzer & Sheeran, 2006). Thus, understanding the psychological determinants of fruit and vegetable consumption is needed to design effective intervention program.

1.5 Research Questions

1. What are the perceptions of university students concerning health behaviors, nutrition behaviors and health intervention?
2. Would the theory-based nutrition intervention effect changes in fruit and vegetable consumption among university students?
3. Would self-efficacy and planning function in a mediating role between intervention conditions and fruit and vegetable consumption?

1.6 Objectives and Hypothesis of this Study

The overall objective of this study is two folded. Firstly, to obtain general information about health status and health behaviors of young people in university setting as an input for intervention mapping to design a nutrition intervention. Secondly, to evaluate the effectiveness of the theory-based nutrition intervention influencing the level of fruit and vegetable consumption in university students. The protocol of Intervention Mapping was applied as a stepwise approach on how to design an intervention. The specific objectives of this study are:

1. To find out general information about health status, perceptions of health and nutrition behavior and the need and pattern of nutrition intervention desired among Thai university students.

2. To determine the changes in university students after receiving theory-based intervention in comparison with the general health education in the following:

2.1 Fruit and vegetable consumption

2.2 Intention to consume more fruit and vegetable

2.3 Planning

2.4 Self-efficacy

3. To examine whether self-efficacy and planning function as mediators between intervention condition and fruit and vegetable consumption.

Hypothesis

This study was conducted to test the hypotheses as follows;

1. Amount of fruit and vegetable consumption of university students in intervention group would increase after intervention.
2. The score of intention to consume more fruit and vegetable in intervention group would increase after the intervention.
3. The score of planning in intervention group would increase after the intervention.
4. The score of self-efficacy in intervention group would increase after the intervention.
5. Self-efficacy and planning mediate between intervention conditions and fruit and vegetable consumption behavior.

1.7 Scope of the Study

The current study sought to find out the effect of the theory-based nutrition intervention on fruit and vegetable among university students.

In the first phase, this study sought to find out general information about health status, health promoting behaviors and healthy nutrition behavior using a cross sectional survey of students from four public universities in main regions of Thailand. Then the next portion of this phase, with the focus group method, it explored how university students perceive healthy diet behavior and investigated the need and pattern of nutrition intervention suitable for them.

In the second phase, this study investigated the effect of the theory-based nutrition intervention on fruit and vegetable among university students using samples from Chiang Mai University, a public university in the northern part of Thailand. The period of the study in both phases was during January 2009-February 2010.

1.8 Expected Outcome and Benefits

The results of the study are anticipated to apply the findings of the theory-based nutrition intervention program in promoting nutrition behavior among young adults. Instead of former traditional basic informative health education campaigns which have been long employed to promote health behaviors, some evidence-based behavioral instruments should be used to enhance the possible increase of these health behaviors. The findings are expected to underscore the need to design more health behavior interventions in the future that implement experimental designs including theory-guided constructs to promote health behaviors.

Chapter 2

Theory and Literature Review

Several theoretical perspectives have been applied to explaining and influencing health behaviors of individuals including nutrition behavior like fruit and vegetables consumption behavior. The purpose of this chapter is to review the theoretical perspectives of this study. The review of the literature is presented in two parts. The first part is theoretical perspectives of this study. The second one is the concept about Intervention Mapping for designing a theory-based nutrition intervention.

2.1 Overview of Health Behavior Change

Health behavior change encompasses a variety of social, emotional, and cognitive factors. Some of these determinants are assumed to operate in concert. Therefore, researchers have aimed at identifying the optimal set of factors that allow for the best prediction or explanation of health behavior change. Such models or theories are subject to debate in health psychology. Which model is the most parsimonious and makes the best prediction of various health behaviors (Schwarzer, 2008). Theories that have received much attention in the effort to explain how people adopt and are engaged in health behaviors, including health enhancing behaviors such as healthy eating, are those of Social Cognitive Theories namely Health Belief Model, the Theory of Planned Behavior, and The Transtheoretical Model. The focus of these models is on identifying a parsimonious set of predictors that includes constructs such as perceived barriers, social norms, disease severity, personal vulnerability, or perceived self-efficacy which have been combined into a prediction equation for explaining behavioral intention and behavior change. The most prominent approaches of this kind are the Theory of Reasoned Action, the Theory of Planned Behavior, and the Protection Motivation Theory (Abraham & Sheeran, 2000; Renner & Schwarzer,

2003). These models share the assumption that the main predictor of health behaviors is the intention (e.g., “I intend to eat more vegetables”). The segment between intentions and behaviors is a black box that is often called the “intention-behavior gap” (Sheeran, 2002). It is, therefore, well known that people often do not behave in accordance with their intentions (Sheeran, 2002). Intentions often fail to be translated into corresponding behaviors (Gutiérrez-Doña, Lippke, Renner, Kwon, & Schwarzer, 2009; Renner et al., 2008; Richert, Reuter, Wiedemann, Lippke, Ziegelmann, & Schwarzer, 2010).

When trying to translate intentions into behavior, individuals are faced with various obstacles, such as distractions, forgetfulness, temptations, or conflicting bad habits. Godin and Kok (1996), who reviewed 19 studies, found a mean correlation of .46 between intention and health behaviors. Abraham and Sheeran (2000) reported behavioral intention measures to account for 20-25% of the variance in health-behavior measures. People often do not behave according to their intentions (Scholz, Nagy, Göhner, Luszczynska, & Kliegel, 2009; Sniehotta, 2009). The traditional view that intentions are the best predictors of behavior has become increasingly questionable according to the finding a set of longitudinal studies where planning and recovery self-efficacy appeared to be the best predictors of various health behaviors (Schwarzer, Schüz, Ziegelmann, Lippke, Luszczynska, & scholz, 2007). Therefore, intentions need to be supplemented by other, more proximal factors that might facilitate the translation of intentions into action (Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009). Some facilitators have been identified, such as perceived self-efficacy and planning. However, it is not fully understood how these two factors interplay with intentions and behaviors. Previous studies have specified self-efficacy and planning as mediators between intentions and behaviors (e.g., Gutiérrez-Doña et

al., 2009; Renner et al., 2008; Richert et al., 2010; Wiedemann, Schüz et al., 2009). In line with such findings, the present study is based on the Health Action Process Approach (HAPA; Schwarzer, 2008). This approach describes the motivational and volitional phases of health behavior change and focuses on self-efficacy and planning skills as key elements of self-regulation in an effort on nutrition intervention to change dietary behavior. Therefore, theorizing about health behavior change should not be limited to the motivational phase only. Factors which are needed to help bridge the intention-behavior gap should be included assuming that there are at least two processes of behavior change, a motivational one that ends with an intention, and a volitional one that ends with successful performance (Schwarzer, 2008).

2.2 The Health Action Process Approach (HAPA)

Given some of health behavior change models being criticized due to the weakness of intention as a predictor to successful behavior change, a model that explicitly includes postintentional mediators to overcome the intention-behavior gap is the Health Action Process Approach (HAPA) (Schwarzer, 1992) It was originally developed in the late 1980s (Schwarzer, 1992) by integrating social-cognitive theory, the theory of reasoned action, and the volition theories of Heckhausen, Gollwitzer, and Kuhl (Heckhausen, 1991; Heckhausen, & Gollwitzer, 1987; Kuhl, 1985) and by applying this synthesis to the field of health behavior change. A great deal of empirical evidence has been accumulated that supports the assumptions of the model (Lippke, Ziegelmann, & Schwarzer, R., 2004; Luszczynska & Schwarzer, 2003; Schwarzer et al., 2007; Sniehotta et al., 2005; Ziegelmann, Luszczynska, Lippke, & Schwarzer, 2007). HAPA model suggests a distinction between (a) preintentional motivation processes that lead to a behavioral intention, and (b) postintentional

volition processes that lead to the actual health behavior (Lippke et al., 2004; Luszczynska & Schwarzer, 2003; Renner et al., 2008; Schüz, Sniehotta, Wiedemann, & Seemann, 2006; Sniehotta et al., 2005; Ziegelmann, Lippke, & Schwarzer, 2006;). In both phases, different patterns of social-cognitive predictors may emerge. In preintentional motivation phase, a person develops an intention to act. During this phase, risk perception is seen as a distal antecedent within the motivation phase. However, risk perception is seen as insufficient to enable a person to form an intention. Rather, it sets the stage for a contemplation process and further elaboration of thoughts about consequences and competencies. While outcome expectancies are seen as being important in the motivation phase, when a person balances the pros and cons of certain behavior consequences. Along with these constructs, another determinant of intention formation is *perceived action self-efficacy*, the belief in one's capability to perform a desired health behavior. Outcome expectancies operate in concert with perceived action self-efficacy contributing substantially to the forming of an intention. Both resources are needed, especially for implementing difficult or complex behaviors, such as dietary behaviors.

In the motivation phase, one needs to believe in one's capability to perform a desired action ("I am capable of initiating a healthier diet in spite of temptations"), otherwise one will fail to initiate that action. In the subsequent volition phase, after a person develops an inclination towards practicing a particular health behavior, the "good intention" has to be transformed into detailed instructions on how to perform the desired action within the postintentional volition processes. The volitional factor (named *planning* or *implementation intentions*; see Gollwitzer, 1999) is seen as the most proximal predictors of behavior because it plays particular attention to what happens after a person formulates the intention to change behavior. Once an action

has been initiated, it has to be maintained. This is not achieved through a single act of will but involves self-regulatory strategies (Renner et al., 2008; Schwarzer, 2008;).

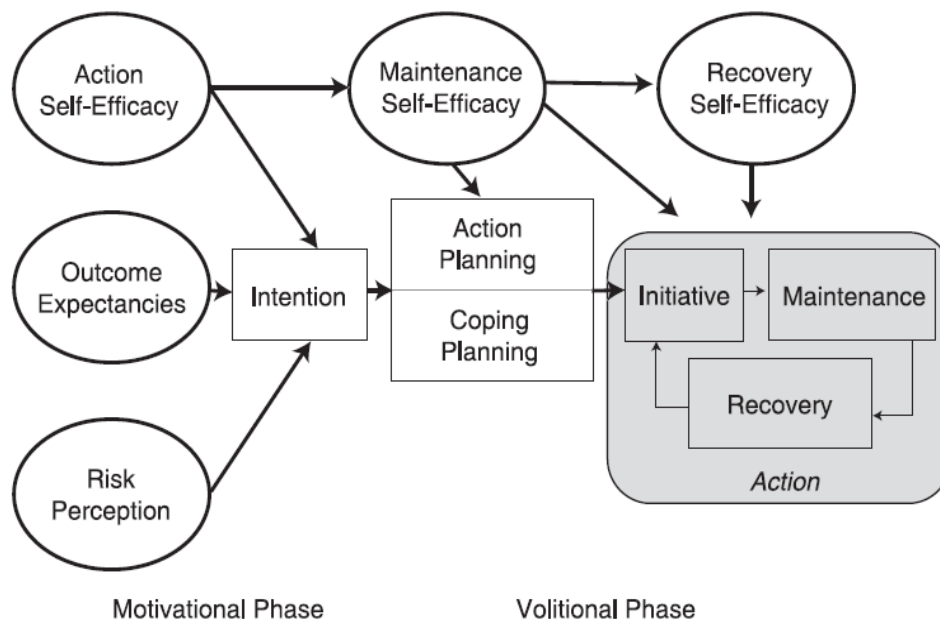


Figure 3 Generic Diagram of the Health Action Process Approach (after Schwarzer, 2008)

The postintentional phase should be further broken down into more proximal factors, such as planning and recovery self-efficacy (Schwarzer, 2008) which will be explained in more detail.

2.2.1 Self-Efficacy and Phase-Specific Self-Efficacy Beliefs

Self-efficacy, a key concept in Social Cognitive Theory, was introduced by Albert Bandura (1997). Bandura assumed that self-efficacy affects the choices people make, their way of acting, the effort they spend, their perseverance and elasticity. It is a focal determinant because it affects health behavior both directly and by its

influence on the other determinants. Efficacy beliefs influence goals and aspirations. The stronger the perceived self-efficacy, the higher the goals people set for themselves and the firmer their commitment to them. Self-efficacy beliefs shape the outcomes people expect their efforts to produce. Those of high efficacy expect to realize favorable outcomes. Those of low efficacy expect their efforts to bring poor outcomes. Self-efficacy beliefs also determine how obstacles and impediments are viewed. People of low efficacy are easily convinced of the futility of effort in the face of difficulties. They quickly give up trying. Those of high efficacy view impediments as surmountable by improvement of self-management skills and perseverant effort. They stay the course in the face of difficulties (Bandura, 2004). Self-efficacy is the judgment of personal capability to organize and executes a particular course of action. It is concerned not with the skill one has but with judgment of what one can do with whatever skill one possesses (Pender, Merdaugh, & Parsons, 2002). It is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events affecting their lives (Bandura, 1994). Perceived self-efficacy is a judgment of one's abilities to accomplish a certain level of performance. Self-efficacy plays important role in health education practices. While societal efforts to get people to adopt healthful practices rely heavily on public health campaigns. These population-based approaches promote changes mainly in people with high perceived efficacy for self-management and positive expectations that the prescribed changes will improve their health. Four possible mechanisms through which health communications could alter health habits: by transmitting information on how habits affect health, by arousing fear of disease, by increasing perceptions of one's personal vulnerability or risk, or by raising people's belief in their efficacy to alter their habits (Meyerowitz & Chaiken, 1987). They found that health

communication foster adoption of healthful practices to the extent that they raise beliefs in personal efficacy.

Perceived self-efficacy of individuals is based on four major sources of information: mastery experience, vicarious experience, verbal persuasion, and physiological state (Bandura, 1997).

1. Mastery experience is the most influential source of efficacy information it is based on mastery experiences because they provide the most authentic evidence of whether one can master whatever it takes to succeed. Successes raise mastery expectations; repeated failures lower them. After strong efficacy expectations are developed through repeated success, the negative impact of occasional failures is likely to be reduced. The relative power of guided enactive mastery to create and strengthen efficacy beliefs has been compared with other models of influence such as modeling of strategies, cognitive simulations of successful performances, and tutorial instruction.
2. Vicarious experiences that alter efficacy beliefs through transmission of competencies and comparison with the attainment of others. More often in everyday life, people compare themselves to particular associates, competitors, or people in other settings engaged in similar endeavors. People are motivated by the successes of others who are similar to themselves but are discouraged from pursuing courses of behavior that they have seen often result in adverse consequences. Individual obtain information about their own capabilities by observing others, especially peers who offer suitable possibilities for comparison (Schunk, 1987).

3. Individuals often receive information that affirms and persuades them that they are able to perform a task (Schunk, 1989). It is easier to create and persist a sense of self-efficacy, especially under difficult circumstances, if significant others communicate their confidence in someone's capabilities than if they express doubt. Verbal persuasion, or social persuasion, serves as a further mean of strengthening people's beliefs that they possess the capabilities to achieve what they seek. It is a commonly used technique for convincing people to do what they initially believe they are incapable of. To extent that persuasive boosts in perceived efficacy lead people to try hard enough to succeed.
4. Physiological and affective states, in judging their capabilities, people rely partly on somatic formation conveyed by physiological and emotion states. Mood states also affect people's judgements of their personal efficacy. Physiological indicators of efficacy play an especially influential role in health functioning and the activities requiring physical strength and stamina.

The perceived self-efficacy may come from those factors in combination or from one factor alone (Bandura, 1986). Therefore, to develop perceived self-efficacy, these factors have to be taken into account.

Perceived self-efficacy has been found to be important at all stages or points in health behavior change (Bandura, 1977). A review of literature from papers published from 1994 to 2006 that described the relationship between psychosocial predictors and fruit and vegetable consumption in adult, the findings indicated that self-efficacy has been found to be one of predictors for this health behavior (Shaikh, et al. 2008). Martinelli (1999) reported that self-efficacy among college students was the strongest

predictor of health-promoting behavior. It is among the factors most strongly and consistently associated with higher consumption of fruit and vegetable and higher likelihood of being in action or maintenance stages of change (Van Duyn, Kristal, Dodd, Campbell, Subar, Stables, Nabeling, & Glanz, 2001). Evidence suggests that enhancing self-efficacy results in nutrition change. Self-efficacy, or behavioral intention were used in 90% of behaviorally focused studies with school-aged children and in about 20% of studies with adults. (Contento, Randell, & Basch, 2002). Changes in self-efficacy beliefs evoked by a self-efficacy intervention may mediate the effects of an intervention on health behavior (Bandura, 1997; Schwarzer, 2001). However, self-efficacy does not always constitute exactly the same construct. Marlatt, Baer and Quigley (1995) have brought up the distinction between action self-efficacy, coping self-efficacy and recovery self-efficacy depending on the particular situation of individuals who may be more or less advanced in change process in the domain of addictive behaviors. During the course of health behavior change, different tasks have to be mastered and that different self-efficacy beliefs are required to master these tasks successfully. For example, a person might be confident in his or her capability to resist fatty foods (high action self - efficacy), but might not be very confident to stick to a healthy diet on a long-term basis when temptations arise (low coping self-efficacy).

Action self-efficacy (also called “action self-efficacy”) refers to the first phase of the process, in which an individual does not yet act but develops a motivation to do so. It is an optimistic belief during the preactional phase. Individual with high action self-efficacy imagine success, anticipate potential outcomes of diverse strategies, and are more likely to initiate new behavior. While those with less self-efficacy imagine failure, harbor self-doubts, and tend to procrastinate (Schwarzer, 2008).

Maintenance self-efficacy (or coping self-efficacy) describes optimistic beliefs about one's capability to deal with barriers that arise during the maintenance period. A new health behavior might turn out to be much more difficult to adhere to than expected, but a self-efficacious person responds confidently with better strategies, more effort, and prolonged persistence to overcome such hurdles (Schwarzer, 2008). This kind of self-efficacy refers to mobilizing resources to continue successful adoption. It also relates to anticipatory coping with relapse crises. Taken together, action self-efficacy refers to taking up an activity (motivational phase) and coping self-efficacy refers to maintaining the behavior (volitional phase). Thus, they represent two distinct aspects of self-efficacy that follow a temporal sequence (Renner et al., 2008).

Recovery self-efficacy addresses the experience of failure and recovery from setbacks. If a lapse occurs, individuals can fall prey to the "abstinence violation effect", that is, they attribute their lapse to internal, stable, and global causes, dramatise the event, and interpret it as a full-blown relapse (Marlatt et al., 1995). High self-efficacious individuals, however, avoid this effect by attributing the lapse to an external high-risk situation and by finding ways to control the damage and to restore hope. Recovery self-efficacy pertains to one's conviction to get back on track after being derailed. The person trusts his/her competence to regain control after a setback or failure and to reduce harm (Marlatt, 2002).

There is a functional difference between these self-efficacy constructs, whereas their temporal sequence is less important. Different phase-specific self-efficacy beliefs may be harbored at the same point in time. The assumption is that they operate in a different manner. For example, recovery self-efficacy is most functional when it comes to resuming an interrupted chain of action. It helps to

gradually return to act upon one's intention, whereas action self-efficacy is most functional when facing a novel challenging demand (Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Luszczynska & Sutton, 2006). This distinction between phase-specific self-efficacy beliefs has proven useful in various domains of behavior change (see Marlatt et al., 1995). Action self-efficacy tends to predict intentions, whereas maintenance self-efficacy tends to predict behaviors. Individuals who had recovered from a setback needed different self-beliefs than those who had maintained their levels of activity. These phase-specific beliefs were studied in a sample of 484 cardiac patients during rehabilitation treatment and at follow-up 2 and 4 months after discharge to predict physical exercise at 4 and 12 months follow-up. The three phase-specific self-efficacies showed sufficient discriminant validity and allowed for differential predictions of intentions and behavior. Persons in the maintenance phase benefited more from maintenance self-efficacy in terms of physical exercise than persons not in the maintenance phase. Those who had to resume their physical exercise after a health related break profited more from recovery self-efficacy in terms of physical exercise than persons who were continuously active (Scholz et al., 2005). Several studies (Rodgers, Wilson, Hall, Fraser, & Murray, 2008; Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002; Rodgers & Sullivan, 2001) have found evidence for phase-specific self-efficacy beliefs in the domain of exercise behavior (i.e., task self-efficacy, maintenance self-efficacy, and scheduling self-efficacy). In studies applying the HAPA, phase-specific self-efficacy differed in the effects on various preventive health behaviors, such as breast self-examination (Luszczynska & Schwarzer, 2003), dietary behaviors (Schwarzer & Renner, 2000), and physical exercise (Scholz et al., 2005).

Self-Efficacy as a Mediator and Moderator

Perceived self-efficacy reflects optimistic self-beliefs when overcoming temptations or adopting a novel course of action. Different challenges have to be met during the course of dietary behavior change. Self-efficacy beliefs are required to master these tasks successfully. Perceived self-efficacy has been found to be important at all points in the health behavior change process including dietary changes (Bandura, 1997; Franko, Cousineau, Trant, Green, Rancourt, Thompson, & Ciccazzo, 2008; Neumark-Sztainer, Wall, Perry, & Story, 2003). People harboring self-doubts might either fail to translate intentions into plans, or they might fail to act upon their plans. Self-efficacy facilitates goal achievement because optimistic self-beliefs instigate planning and behavioral initiative. Also, self-efficacious people feel more confident about trying a novel or difficult behavior, and they invest more effort in maintaining a desired behavior when barriers arise. Self-efficacy has been found to be consistently associated with consumption of fruit and vegetable (Brug, Lechner, & De Vries, 1995). Persons with high levels of dietary self-efficacy consume more fruit and vegetable than others (Luszczynska et al., 2007). A study on eating behaviors among adolescents also found that self-efficacy operated as a mediator in fruit consumption (Ball, MacFarlane, Crawford, Savige, Andrianopoulos, & Worsley, 2009).

Self-efficacy can be a moderator when planning mediates in intention-behavior relationship. In general, moderation takes place if a variable modifies the form or strength of the relation between an independent and a dependent variable or the mediation role of another variable between the two (MacKinnon, 2008). Moderators, therefore, provide information on when the effects are present. Self-efficacy functions as a putative moderator for the degree to which planning mediates the intention-behavior relationship because it reflects optimistic self-belief when overcoming

temptations or adopting a novel course of action. Self-efficacy should moderate the planning behavior relation because people harboring self-doubts might fail to act upon their plans. For persons with high levels of self-efficacy, planning might be more likely to facilitate goal achievement because optimistic self-beliefs instigate the execution of plans: Whether intentions affect behavior via action plans (mediation) might depend on the level of self-efficacy (moderation) (Lippke, Wiedemann, Ziegelmann, Reuter, & Schwarzer, 2009).

2.2.2 Planning

According to the most prevailing theories of health-behavior change, such as the Theory of Planned Behavior, it is considered that behavioral intentions are the most immediate and important predictor of behavior. Although the construct of intention is indispensable in explaining behavior adherence, its predictive value is limited. Motivation alone does not suffice to change behavior as intention leaves large amount of behavioral variance unexplained. This phenomenon has been labeled 'intention-behavior gap'. When trying to translate intentions into behavior, people are faced with various obstacles, such as distractions, forgetfulness, or conflicting bad habits. As a result, research has identified additional postintentional, volitional processes that moderate or mediate the intention-behavior relationship (Abraham, Sheeran, Connor, de Vries, & Otten, 1999). Good intentions are more likely to be translated into action when people develop success scenarios and preparatory strategies of approaching the difficult task. The terms planning and implementation intentions have been used to address this phenomenon. Research on action plans has been suggested long ago. Leventhal, Singer, and Jones (1965) have stated that fear appeals can facilitate health behavior change only when combined with specific

instructions on when, where, and how to perform them. Renewed attention to planning emerged when the concept of implementation intentions was introduced (Gollwitzer, 1999). Planning when, where, and how to act can facilitate behavior change; people are more likely to act upon their intentions when generating such a plan (Gollwitzer & Sheeran, 2006). Writing down when and where to eat healthy foods makes people more apt to eat such foods, compared with control persons who do not plan in such detail (Verplanken & Faes, 1999).

Planning, in behavioral self-regulation, can serve various purposes. In most instances, health behavior change involves adopting a new pattern of behavioral response while extinguishing a previous or undesired behavior. So, it can be defined as the process of generating a sequence of behaviors used to translate an individual's resources into actions aimed at goal achievement (Austin & Vancouver, 1996). Planning is more than simply an extension of the intention since it includes situation parameters ("when," "where") and a preprogrammed sequence of action ("how"). It is more effective than intentions when it comes to the likelihood of performance and speed of performance, mainly because the behavior is being elicited almost automatically when the relevant situational cues are encountered (Gollwitzer, 1999; Sniehotta, Schwarzer, Scholz, & Schütz, 2005). People also do not forget their intentions easily when specified in a when, where, and how manner (Armitage, 2004). Planning plays a major role in the volition phase and is assumed to facilitate goal pursuit by linking behavioural responses to specific situations. Gollwitzer (1996) stated that planning can help individuals overcome intellectual as well as volitional problems of goal achievement. The intellectual benefits of planning involve developing a strategy to achieve a goal; its volitional benefits involve increased

persistence, decreased distractibility and a readiness to seize opportunities to act (Diefendorff & Lord, 2003).

2.2.2.1 Two Sub constructs of Planning

Planning can be subdivided into two subconstructs that serve different purposes. The first subconstruct is *action planning* specifying the intended action in terms of when, where, and how to act (Leventhal, Singer, & Jones, 1965) which, as previously stated, Gollwitzer (1999) has called this “implementation intentions”. The second subconstruct is *coping planning*, alludes to coping strategies to prioritize the intended over the habitual responses when obstacles or barriers are faced.

In the process of *action planning*, an action sequence is linked to specific parameters of a situation in terms of ‘when’, ‘where’ and ‘how’ to perform a behavior (e.g., Armitage, 2007; Sniehotta, Scholz, & Schwarzer, 2005). This process can also be considered as a mental simulation of behavior in crucial key situations (Pham & Taylor, 1999). Holding such a mental representation in a critical situation is assumed to lead to an immediate and efficient behavioral response without conscious awareness. Increased information processing (e.g., accessibility and strength of cue-response links) has been identified as an underlying working mechanism of implementation intentions (Webb & Sheeran, 2007). Self generated implementation intentions predict physical activity over and above goal intentions for an extensive period of time (up to 12 months; Ziegelmann, Luszczynska, Lippke, & Schwarzer, 2007).

Coping planning, on the other hand, refers to the anticipation of barriers (e.g., distractions, temptations or conflicting habits) and the generation of behavioural (or cognitive) responses to overcome them (e.g., Sniehotta et al., 2005). An action plan

specifies the details of action implementation (the when, where and how), whereas a coping plan specifies how to cope with anticipated barriers. Coping planning differs significantly from action planning in both situational and the behavioral components. Situational cues associated with action plans are located in the individual's environment and are defined by 'where and when' to act.

Action planning and coping planning are conceptualized as being two distinct theoretical constructs. Whereas action planning is more useful for the initiation of complex behaviors, coping planning is assumed to facilitate behavior maintenance (Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008). Action plans are behavior-facilitating strategy that is mostly associated with action initiation in good opportunities to act. In contrast, coping plans are barrier-focused, and are more relevant for resolving maintenance problems. Previous study of Ziegelmann, Lippke, and Schwarzer (2006) demonstrated that action planning predicted behavior from the beginning of the behavior change process, whereas coping planning resulted in delayed effect by predicting change in physical activity among orthopaedic rehabilitation patients at the 4-week and the 6-month follow-up, but not at an initial 2-week follow-up.

However, both facets of planning jointly work together in concert and thus can be considered in combination. Intervention studies show that individuals who engage in a combination of action planning and coping planning display greater changes in behaviour than individuals who focus on action plans alone (Sniehotta, Scholz, & Schwarzer, 2006; Ziegelmann et al., 2006; Widemann, Lippke, Reuter, Ziegelmann, & Schwarzer, 2011; Wiedemann, Lippke, Reuter, Ziegelmann, & Schüz, 2011a).

2.2.2.2 Empirical Evidence for Planning in Health Behavior Change

To date, research has accumulated many evidences for the effectiveness of planning in health behavior change.

A longitudinal intervention study of Sniehotta et al. (2005) to test two brief planning interventions designed to encourage cardiac patients to engage in regular physical exercise following discharge from rehabilitation. The intervention comprised action plans on (a) when, where, and how to act, and (b) coping plans on how to deal with anticipated barriers. An experimental longitudinal trial was conducted to test two interventions that either focused on action planning alone, or on a combination of action planning and coping planning. Participants were randomly assigned to either one of the intervention groups or a standard-care control group. Result indicated that participants in the combined planning group did significantly more physical exercise 2 months post-discharge than those in the other groups. Two types of planning have proven to be useful in explaining changes in health-related behavior.

An experimental study done by Luszczynska, Tryburcy, and Schwarzer (2006) explored the effects of e-mail messages interventions targeting self-efficacy alone or combined with action plans in the context of fruit and vegetable consumption. It indicated that the intervention combined self-efficacy and action plans resulted in an increase of fruit and vegetable consumption at 6 months after the intervention. Self-efficacy change mediated the effects of the self-efficacy intervention on change in fruit and vegetable consumption, whereas changes in both self-efficacy and planning mediated the effects of the combined intervention (addressing self-efficacy and planning).

Armitage (2009) has done a study to test the effectiveness of implementation intentions to decrease alcohol consumption and control for possible demand

characteristics by employing an active control condition and contrasting experimenter-provided with self-generated implementation intentions. Four conditions of the study were provided including the ones with implementation intention. Implementation intentions consist of two components: (a) the identification of a critical situation and (b) the identification of an appropriate behavior response. In other words, implementation intentions are “if-then” plans that work by linking in memory a critical situation (“if”) with an appropriate behavioral response (“then”). Specifying where and when one will act ensures that the appropriate behavioral response will be triggered at the appropriate time and place in the future. The key finding of this study was that implementation intentions, regardless of mode of delivery, were effective in reducing alcohol intake. The present findings suggest that implementation intention interventions can be self-generated or provided by health professionals to similar effect.

In a longitudinal study of Van Osch, Reubsaet, Lechner, Candel, Mercken, and de Vries (2008) examining antecedents of parental sunscreen use, intention emerged as the most powerful predictor of behavior, followed by action planning and self-efficacy expectations, together explaining 35.4% of parental sunscreen use after five months. Strong support was found for both mediating and moderating influences of action planning on the intention-behavior relationship. The results support theoretical considerations to add postintentional cognitions to current health behavior models.

A controlled trial design of van Osch, Lechner, Reubsaet, Wigger, and de Vries (2008) was used to evaluate the efficacy of coping planning intervention to prevent smoking relapse in the context of a national smoking cessation contest (‘Quit & Win’). Result indicated that the coping planning intervention increased conservative 7-month continuous abstinence rates from 10.5 to 13.4%, indicating that,

if implemented correctly, coping planning can significantly reduce long-term smoking relapse. It is plausible that the formulated coping plans play a much more important role in this maintenance phase than in the earlier initiation phase.

A cross sectional study of Crawford, Ball, Mishra, Salmon, and Timperio (2006) examined associations between shopping, food-preparation, meal and eating behaviors and fruit and vegetable intake among women. This survey identified the importance of planning on behavior. Results indicated that forward-planning, as well as enjoyment of and high perceived value of meal shopping, preparation and consumption were associated with healthier intakes of fruits and vegetables. Women who more frequently planned meals before they went shopping, wrote the shopping list, planned what they will eat for each meal, were more likely to consume two or more servings of vegetables daily.

2.2.2.3 Planning as a mediator

When the relationship between two variables is partially or totally accounted for by an intervening variable, this variable is called a mediator. Mediation analysis helps to identify intervening variables in the relationship between two variables, such as intention and behavior (Reuter, Ziegelmann, Lippke, & Schwarzer, 2009). Planning has been found to mediate the intention-behavior relation (Gollwitzer & Sheeran, 2006). Why does planning facilitate the impact of good intentions on behavior? Planning is more than simply an extension of an intention because it includes specific situation parameters (“when,” “where”) and a sequence of action (“how”). It is more effective than intentions when it comes to the likelihood and speed of performance, partly because behavior might be elicited almost “automatically” when the relevant situational cues are encountered. People tend to remember better their

intentions when specified in a when, where, and how manner. This has important implications for health-behavior interventions. Planning is an alterable variable. It can be easily communicated to individuals with self-regulatory deficits.

In the study of Reuter et al. (2009) a long-term study of intention, planning, and physical activities was conducted among a sample of 328 individuals in orthopedic rehabilitation. The result showed that the orthopedic rehabilitation led to an initial increase in planning and behavior, followed by a decrease after 6 months and stabilization for the next 2.5 years. Intention revealed a slight but constant decrease for 6 months and remained stable up to 3 years after rehabilitation. The mediation model confirmed planning as mediator between intention and physical activity in participants.

Planning is hypothesized to mediate the intention-behavior relation (e.g., Schwarzer et al., 2008) and is the critical psychological process through which behavioral intentions are translated into behavior. Individuals with higher intentions are more likely to plan when, where and how to act; their plans help them translate their intentions in behavior. This mediating effect of planning between intention and behavior has been demonstrated in an experimental study in which planning was experimentally induced (e.g., Reuter, Ziegelmann, Wiedemann, & Lippke, 2008). Result of study 1 showed that participants of the motivational treatment significantly increased their planning activities compared to participants of the control group. Participants of the planning treatment, in study 2, showed increases in behavior as opposed to participants in control condition. Only in the treatment group were these changes mediated by changes in self-reported planning. In the study of Scholz et al. (2008), the result also indicated that inclusion of the two planning factors accounted for substantially more behavior variance than intention alone did. Coping planning

mediated the intention-behavior relationship in formerly active participants. The mediating effect of planning was also presented in observational studies in which planning was measured psychometrically (e.g., Norman & Conner, 2005).

A recent randomized controlled trial study by Wiedemann et al. (2011) also indicated that planning intervention have proven effective to change behavior. A combined action planning and coping planning intervention was tested in a field setting comparing with an active control group. Results showed that action planning and coping planning mediated intervention effects on fruit and vegetable intake not only separately but also simultaneously. Interestingly, another study by Wiedemann et al. (2011a) tested effects of the number of action plans and coping plans at two stages of change in physical activity in motivated, less active persons (intenders) and active individuals (actors). Findings indicated that intenders generated more action plans than actors. Intervention effects on activity were strongest in intenders and those who specified more plans. This study underlines the effectiveness of action plans and coping plans, particularly in less active individuals.

2.2.3 Empirical Evidence of HAPA

HAPA was successfully applied to various health promoting behaviors such as dental flossing, seat belt use, dietary behavior, and physical activities. In a set of four longitudinal studies in adoption and maintenance of four health behaviors of Schwarzer et al. (2007), it was aimed to examine the applicability of the HAPA model by replicating it across different health behaviors. The model used in these studies includes three predictors of the behavioral intention (motivational self-efficacy, outcome expectancies, health risk-perception) and three predictors of self-reported behavior (intention, recovery self-efficacy, planning). Result indicated that, by

structural equation modeling, one common model fits all four data sets well. Self-efficacy and planning seemed to be functional as proximal predictors of health behaviors. Planning was supposed to bridge the gap between intentions and behavior.

The longitudinal on-line study of Scholz et al. (2008) confirmed the assumption of the HAPA model for the prediction of health behavior as inclusion of the two planning factors accounted for substantially more behavior variance than intention alone. Action planning appears to predict behavior only when intentions are high. For actors, coping planning represents a critical self-regulation strategy to maintain their physical activity levels. The results of the study confirm differentiating between a motivational and a volitional phase and subdividing the latter into initiation and maintenance as in the HAPA.

2.3 Health Intervention

2.3.1 Intervention Development

Health education for behavior change can be a very effective tool to reach health promotion goals. The focus is on learning experiences leading to voluntary behavior change. Those learning experiences are to be planned very systematically and based on previous research on determinants of the behavior and on theoretical knowledge about behavior change. It has been shown that systematic planning and use of learning principles are determinants of effectiveness (Kok, van den Borne, & Mullen, 1997). One of the things most of the health educators do when they have to develop a health education intervention for a particular health problem, priority population or intervention context, is to have a look at what others have done in similar situations. Frequently, however, their consideration of existing interventions will turn into disillusion (Shaalma & Kok, 2009). Bartholomew, Parcel, Kok, and

Gotlieb (2006) indicated that the development of theory- and evidence-based health education intervention is a complex process in which interventionists in collaboration with priority groups and stake holders make many decisions about objectives, change techniques, intervention materials and activities, delivery modes and implementation issues. In this development process, interventionists have to find a balance between employing change techniques that should be effective in an ideal world, and intervention activities and materials that match the reality of priority populations and intervention context; they have to find a balance between what they prefer to do, and what is feasible to do. Interventionists in search for guidelines for their future interventions would need intervention descriptions that provide them with information about what and how theory was used in the decision-making about intervention design, and about when and how intervention design decisions were affected by, for instance, practical and political considerations (Bartholomew et al., 2006). A health promotion program is most likely to benefit participants and communities when it is guided by social and behavioral science theories of health behavior and health behavior change (Norman, Abraham, & Connor, 2000). Theory-driven health promotion program require an understanding of the components of theories, as well as an understanding of the operational or practical forms of these theories. Finding and applying relevant theories is a professional skill that health educators have to master (Bartholomew, Parcel, Kok, & Gottlieb, 2001).

Interventions to change behavior should draw on theories of behavior and behavior change in their development (Michie, 2008). There are three main reasons for advocating the use of theory in designing interventions. First, interventions are likely to be more effective if they target causal determinants of behavior and behavior

change; this requires understanding these causal determinants, i.e., theoretical mechanisms of change. Second, theory can be tested and developed by evaluations of interventions only if those interventions and evaluations are theoretically informed. Third, theory-based interventions facilitate an understanding of what works and thus are a basis for developing better theory across different contexts, populations, and behaviors.

The development of theory- and evidence-based health education interventions is a complex process in which interventionists in collaboration with priority groups and stakeholders make many decisions about objectives, change techniques, intervention materials and activities, delivery modes and implementation issues (Bartholomew et al., 2006). Health educators or interventionists have to find a balance between employing effective change techniques, and intervention activities and materials that match the reality of priority populations and intervention contexts. They have to find a balance between what they prefer to do, and what is feasible to do (Shaalma & Kok, 2009). Key components of successful programs include actively engaging participants and incorporating principles common to such theoretical approaches.

2.3.1.1 Concept of Intervention Mapping

Intervention Mapping is a methodology used for designing and implementing complex interventions or programs. It has been used for over 20 years for systematically designing multifaceted programs involving numerous interventions directed at various individuals and environments (Bartholomew, Parcel, & Kok, 1998). Intervention Mapping is not a theoretical or conceptual framework but rather a description of a logical process. It is one part of dynamic health promotion

intervention planning. Intervention Mapping was developed as a planning framework for the development of theory- and evidence-based health promotion programs (Bartholomew et al., 1998). Intervention Mapping provides guidelines and tools for the empirical and theoretical foundation of health promotion programs, for the application of theory, for the translation of theory into actual intervention activities and materials, for the management of program adoption and implementation, and for the collaboration between health educators, researchers, priority groups and stakeholders. Intervention Mapping enables health promoters to develop interventions that include theory-based intervention strategies and materials that may accomplish program objectives, and that match priority populations and intervention contexts. Intervention Mapping guarantees that health promoters anticipate a widespread and sustained program implementation, and collaborate with priority groups and stakeholders. As such, Intervention Mapping serves as a way to map the path of intervention development from recognizing a need or problem to testing solutions (Bartholomew et al., 2006).

The purpose of Intervention Mapping is to provide health promotion program planners with a framework for effective decision making at each step in intervention planning, implementation, and evaluation. Health promotion has been defined as “Any combination of education, political, regulatory and organizational supports for actions and conditions of living conducive to the health of individuals, groups or communities” (Green & Kreuter, 2005), and health education is a subset of health promotion strategies that are primarily based on education. An intervention can be designed to change environmental or behavioral factors related to health, but the most immediate impact of an intervention is usually on a set of well-defined determinants of behavior and environmental conditions.

2.3.1.2 Intervention Mapping as a Stepwise Approach for Conducting an Intervention

Intervention Mapping is a stepwise approach for theory and evidence based development and implementation of interventions. It comprises six steps, each leading to a product that guides the next step (Bartholomew et al., 2006).

Intervention Mapping describes the intervention development process in six phases (Shaalma & Kok, 2009): (1) assessing needs and capacities, (2) specifying program objectives, (3) selecting theory-based intervention methods and practical intervention strategies, (4) designing and organizing of the program, (5) specifying adoption and implementation plans and (6) generating an evaluation plan. To simplify in daily language: (1) What is the problem? Causes? Risk groups? What are the resources for change? (2) What do we wish to change, and why? (3) How can we accomplish these changes? (4) In such a way that it makes sense and will be implemented? (5) How can we facilitate sustained implementation? and (6) Did it work out the way we planned?

Intervention Mapping reflects the collaborative, iterative and cumulative decision-making processes underlying the development of theory-and evidence -based health promotion (Bartholomew et al., 2006). Interventionists move back and forth between intervention development phases, but finally, the decision-making in each phase is based on the decision that were made in previous phases, and neglect of a particular phase may lead to mistakes and inadequate decision in subsequent phases. Intervention mapping requires interventionists to specify intervention change objectives that target psychological correlates of the preparatory behaviors that are linked to a particular health promotion behavior. It also asks interventionists to

document the identification of behavior change techniques that may be useful in achieving these change objectives, including their deliberations regarding the conditions under which these techniques are potentially effective (Kok, Shaalma, Ruiters, Brug, & Van Empelen, 2004). Intervention Mapping also asks interventionists to describe how they operationalized potentially useful behavior change techniques into intervention activities and materials in such a way that these materials and activities match priority groups, intervention contexts and the conditions for effectiveness. Finally, the use of Intervention Mapping in intervention design leads to intervention description that specifies and underpin the relation between intervention change objectives, behavior change techniques, and intervention activities and materials (Shaalma & Kok, 2009). Such documentation provides a means to communicate the intervention content, its rationale, and the underlying decision-making processes to everyone involved in the development process (Bartholomew et al., 2006). In a similar vein, it provides a means to communicate the intervention design process to other interventionists and researchers in the fields of health psychology, health education and health promotion (Shaalma & Kok, 2009).

In this study, the designing of health intervention focusing on dietary behavior among university students will be described using Intervention Mapping as a guideline. There are six steps in Intervention Mapping. Within each step, specific tasks are performed which will guide the decision making process. Six steps of Intervention Mapping will be described in Chapter 3.

2.3.1.3 Empirical Evidence for Intervention Mapping

Intervention Mapping has been used to develop intervention programs for a variety of health behaviors. There are bodies of programs done applying the theory-based Intervention Mapping as follows;

Cullen, Bartholomew, Parcel, and Kok (1998) used the Intervention Mapping process to develop a 5 A Day badge to increase fruit and vegetable intake in 4th- to 6th-grade junior girl scouts. Social Cognitive Theory constructs of behavioral capability, self-efficacy, and self-control provided the framework for choosing the intervention methods: skill building, role modeling, self-monitoring, goal setting, and contracting.

A program to increase Pap Screening behavior among women in Taiwan was developed by Hou, Fernandez, and Parcel (2004). Intervention Mapping guided the development of this program. The preliminary evaluation results (Hou, Fernandez, Baumler, & Parcel, 2002) showed that women in the intervention group reported a higher rate of completing Pap test screening that did women in the comparison group after intervention. Intervention groups of women also had higher perceived pros of giving Pap test.

Perez-Rodrigo, Wind, Hildonen, Bjelland, Aranceta, Klepp, and Brug (2005) applied Intervention Mapping protocol to develop a school based fruit and vegetable promotion program targeting 10- to 13-year-old school children. Based on a needs assessment, the program named Pro Children was developed and was split into performance objectives and related personal, social and environmental determinants. The program was theoretically similar but culturally relevant in design, implementation and evaluation in Norway, the Netherlands and Spain. Intervention Mapping strongly encouraged using evidence-based and theory-driven intervention

methods, strategies and materials. Intervention Mapping also helped researchers to systematically get input from different actors, such as program developers, users and the target population. The program, as a result, was tailored to the specific needs and characteristics of participants as well as to available resources and skills of the main actors. The Pro Children intervention was aimed at both the individual and the environmental level, including suggestion for organizational change such as building school project committees and changes in school policies like creating the fruit break. It also encouraged active participation in learning processes and family support.

A study of Mkumbo, Shaalma, Kaaya, Leerlooijer, Mbwambo, and Kilonzo (2007) used a theory- and evidence-based approach in application of Intervention Mapping in developing and implementing school-based sexuality and HIV/AIDS education targeting young people aged 12-14 in Tanzania. The Intervention Mapping protocol facilitated the development of a comprehensive sexuality and HIV/AIDS education program relevant and appropriate to the social cultural context and the needs of learners in Tanzania. The paper has demonstrated that, although the Intervention Mapping was developed in the western context, it can be used in a flexible manner to adapt to local contexts. Intervention Mapping is proved to be a framework for guiding planning, development, implementation and evaluation of health promotion program.

A similar study of Wolfers, van den Hoek, Brug, and Zwart (2007) used Intervention Mapping to develop a program to prevent sexually transmittable infection, including HIV, among heterosexual migrant men dividing into two subgroups; men with an Afro-Caribbean background and unmarried men with a Turkish and Moroccan background. After a need assessment was carried out, a literature review was done, key figures were interviews and seven group discussions

were held. The needs assessment showed that importance of personal factors such as self-efficacy and attitude as well as socio-cultural factors and the accessibility and availability of condoms. Subsequently, the result were translated into specific objectives (“Change objectives”) and used in intervention development for those groups. A matrix of change objectives was made for each subgroup and suitable theoretical methods and practical strategies were selected. It is concluded that this careful well-informed intervention development using Intervention Mapping is feasible in the daily practice.

In the paper by Van Oostrom, Anema, Terluin, Venema, de Vet, and van Mechelen (2007), they applied Intervention Mapping as a useful to develop a workplace intervention for sick-listed employees with stress-related mental disorders. The principles of Intervention Mapping were applied to combine theory and evidence in the development, implementation and planning for the evaluation of a participatory workplace intervention. All stakeholders were involved in focus group interviews. Using Intervention Mapping resulted in a structured return-to-work intervention, specifically tailored to the needs of sick-listed employees with SMDs. Return to work was proposed as a behavioral change, and the Attitude-Social influence-self-efficacy model was identified as a theoretical framework. The Intervention Mapping was found to be a promising method to develop interventions tailored to a specific group in the field of occupational health. The result of this study showed that Intervention Mapping has been an appropriate tool that can be used to design interventions in occupational health research.

A similar paper by Vermeulen, Anema, Schellart, van Mechelen, and van der Beek (2009) also described how Intervention Mapping has been applied for development of a participatory return-to-work intervention for temporary agency

workers and unemployed workers sick-listed due to musculoskeletal disorders. The paper described the structured and stepwise process of development, implementation and evaluation of a theory- and practice-based participatory RTW program for both groups of workers. The Intervention Mapping protocol was used to develop a tailor-made RTW program. The Attitude-Social influence-Self-Efficacy (ASE) model was used as a theoretical framework for determinants of behaviour regarding RTW of the sick-listed worker and development of the intervention. To ensure participation and facilitate successful adoption and implementation, important stakeholders were involved in all steps of program development and implementation. By discussing with stakeholders in focus groups about important factors for innovations, such as potential advantage, complexity of the new program and compatibility with daily practice, it is believed that this will enhance the success of future implementation. It was concluded that Intervention Mapping has been proved to be a promising tool for development of tailor-made Occupational Health Care intervention for the vulnerable working population.

McEachan, Lawton, Jackson, Conner, and Lunt (2008) developed a worksite physical activity intervention using an Intervention Mapping protocol. The intervention was designed to target awareness, motivation and environment and to address behavioral and interpersonal outcomes. Intervention Mapping was found to be a useful tool for developing a theory based intervention.

Ammendolia, Cassidy, Steensta, Soklaridis, Boyle, Eng, Howard, Bhupinder, and Cote (2009) used a qualitative synthesis based on the Intervention Mapping methodology. Evidence from systematic reviews, practice guidelines and key articles on the prognosis and management of low back pain and improving return- to-work was combined with theoretical methods for managing low back pain and changing

behavior. Experts and stakeholders' consensus and nine focus groups' feedback were used to systematically operate into return-to-work Program. In this study, a detailed five steps of return-to-work program was developed. Intervention Mapping provided a useful framework to develop a comprehensive return-to-work program tailored to the setting.

The method of Intervention Mapping has been found to be a useful tool for tailoring in a systematic way since it was also used to tailor the original Chronic Disease Self-Management Program (CDSMP) for employees with a chronic somatic disease in the Netherlands (Detaille, van der Gulden, Engels, Heerkens, & van Dijk, 2010). This recent study presents the systematic development and content of the training program. A needs assessment has been carried out by a literature review and qualitative focus groups with employees with a chronic disease and involved health professionals. After that, the relevant determinants of self-management behavior at work have been identified for the target population and the objectives of the training were formulated. Result indicated that the intervention was designed to address general personal factors such as life style, disease-related factors (i.e., coping with the disease) and work-related personal factors (i.e., self-efficacy at work).

A recent study by Corbie-Smith et al. (2010) described how Project GRACE, an HIV intervention project, integrated Intervention Mapping methodology with community-based participatory research (CBPR) principles to develop a multilevel, multigenerational HIV prevention intervention. In this study, the approach used to develop the intervention was described. Intervention Mapping was chosen as their method of intervention development process using a structured approach that moves from theory to practice. It was found to be the structural approach that can be adapted to incorporate the principles of CBPR.

The method of Intervention Mapping was also used by a study of Zule, Coomes, Karg, Harris, Orr, and Wechsberg (2010) as a modified Intervention Mapping approach to develop and refine a single-session motivational intervention for Methamphetamine-using men who have sex with men. It indicated that Intervention Mapping provided a useful, systematic approach to intervention development but some steps in the process needed to be adapted. Intervention developers must remain flexible and be prepared to adapt the process to the situation.

2.4 Related Research about Health Intervention to Promote Fruit and Vegetable Consumption

Effects of fruit and vegetable consumption interventions targeting self-efficacy alone or combined with action plans were examined in a study done by Luszczynska, Tryburcy, and Schwarzer (2005). Results indicated that at a 6-month follow-up, the two experimental groups gained equally from the interventions, as documented by changes in behavior. In both intervention groups, change in respective cognitions predicts change in fruit and vegetable consumption.

There were also some recent randomized trials of intervention focusing on fruit and vegetable consumption. A study of Stadler, Oettingen, and Gollwitzer (2010) tested whether an intervention that combined information with self-regulation strategies had a better effect on eating fruit and vegetables than an information-only intervention. Results indicated that participants in both groups ate more fruit and vegetables than at baseline during the first 4 months after intervention. Two years later, participants in the information plus self-regulation group maintained the higher intake, whereas participants in the information group returned to baseline levels. Another randomized trial focused on tailoring and motivational interviewing to

promote fruit and vegetable consumption among older adults including both colorectal cancer (CRC) and noncolorectal cancer-affected (N-CRC) individuals (Campbell et al., 2009). The study tested two different methods of communicating and promoting health behavior change alone or in combination: tailored print communication (TPC) and brief telephone based motivational interviewing (TMI). Result indicated that there was a significant increase in fruit and vegetable consumption in the combined intervention group in the entire sample ($p < .05$).

An RCT undertaken by Kellar and Abraham (2005) testing the efficacy of a brief research-based leaflet-like intervention to promote eating the recommended daily intake of fruit and vegetables (RDIFV) also showed that intervention participants, who received persuasive communication targeting self-efficacy and intention, had stronger post-intervention intention to consume RDIFV and was found to have eaten more fruit and vegetables and to have consumed the RDIFV more frequently.

2.5 College Health and Nutrition

College students are in the stage of adolescence moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences the health of lifetime (Splette & Story, 1997). When young people begin college, the new environment may place them at increased risk for developing unhealthy eating habit and adopting a more sedentary lifestyle. Since beginning college is a period when students begin to manage their own lives and adopt and solidify their health-related habits. Young adults entering college are faced with trying to adapt to changes in academic workloads, support networks, and their new environment. Coupled with these changes and new-found responsibilities,

college students have greater freedom and control over their lifestyles than ever before. Thus, this transition period is an opportunity to establish healthy lifestyle behaviors (Dinger & Waigandt, 1997). College students are at a time and place in their lives when their behavior is conducive to change, if they make positive changes in dietary habits and exercise practices, these changes could persist into adulthood (Serdula, Ivery, Coates, Freedman, Williamson, & Byers, 1993). Despite the fact that these health promoting behaviors during this age are important, health promotion in college years has not been well focused. As though health itself were merely ancillary and unrelated to student learning, engagement, and success, the health-related programs, services, and systems of support that colleges and universities provide students are undervalued and marginalized in today's academy. More broadly, the concept of "health" on campus has become uncomfortably equated with its delivery systems "health services" which are in turn categorized as and reduced to "auxiliary" student services. The health and well-being of students from the broad perspective contribute to, and, indeed, make possible student success. Health creates capacity; student whose health status is positive and flourishing have greater ability and readiness to learn and engage fully in all meaningful educational experiences inside and outside the classroom (e.g., residential life, athletics, community service learning opportunities, civic engagement, etc.) (Silverman, Underhile, & Keeling, 2008). In the framework of student success, student health is appreciated as the reflection of the state of physical, emotional, psychological, and social well-being that constantly intentionally or unintentionally affects student learning. Student health is, then, a critical foundation with which students can optimize their learning, reach their potential, and achieve their goals (Silverman et al., 2008). College graduates should be turned out with academic and professional knowledge and skills who also have the

understanding and motivation to maintain the healthy lifestyle essential for full, active, and productive lives. This also has the potential to carry on to the next generation, as the children of today's students can be raised in households with good health habits. College can and should be incubators for young adults to develop good health practices, educating and motivating students about the best choices for a healthy "mind and body" lifestyle to benefit them and their future families (Scrimshaw, 2008).

Nutrition and exercise are cornerstone that affects and defines the health and development of all people across the entire lifespan (WHO, 2002). Research indicates that poor nutrition and health can compromise learning for children. At any age, nutritional deficiencies can impair cognitive performance (Scrimshaw, 2008). Despite the recognition of the benefits of nutrition, there has been evidences indicating that adolescents and young adults are at risk in several points as follows (Nelson, 2008)

1. The transition from adolescence to young adulthood appears to be an important time when many individuals may be gaining excess weight and becoming overweight and/ or obese.
2. Physical activity is decreasing while sedentary activity, such as screen-time media use, is increasing among this age group.
3. Dietary intake is poor, with few young adults at this age consuming diets that are consistent with current recommendations for health.

It is important to focus on the college age group because it is during that time when individuals are most likely to experience dramatic changes in weight, physical activity patterns and dietary habits. These trends may begin to surface earlier in adolescence and/ or childhood, they are continued (possibly at an accelerated rate)

during the late adolescent and early adult years, thus making this a unique opportunity for health promotion intervention (Nelson, 2008).

2.6 Rationale for the Present Study

The literature reviewed in chapter 1 and in this chapter provides the following rationale for the present study.

Thailand has been facing the dramatic transition that affects health status of its people, i.e., changing lifestyles leading to unhealthy nutrition behaviors such as consuming more oil, fats and animal meats and less vegetables and fruit (Kosulvat, 2002; MOPH, 2004) These factors can be regarded as one of the leading causes of obesity (Kantachuvessiri, 2005), non infectious diseases and premature death. From the reviewing of literature as described in Chapter 1 about public health and nutrition concern in Thailand, it has been identified that Thai people generally consumed less fruit and vegetable than daily recommendation. There is a dramatic shift in the food consumption pattern that leads to many non communicable diseases such as cardiovascular disease and cancer. Food consumption pattern transition occurring in Thailand has been resulted from life style changes. Thai people, especially children and young people like university students, consume more sweetened carbonated drinks, high fat and salted snacks while consuming less fruit and vegetable. An evidence revealed that Thai undergraduates consume most of their higher than recommended amounts of sugar in drinks, followed by bakery products and Thai sweets (Promdee, Trakulthong, & Kangwantrakul, 2007). These behaviors place young adults in risk group for themselves and their future families because young adults with poor dietary habits are likely to become older adults with poor dietary habits.

Health behaviors, such as physical activities, stress management, health responsibility and nutrition practices, have not been surveyed among large group of these young people. The need for nutrition and health education is suggested to be targeted in both policies and population level (Banwell, Lim, Suebsman, Bain, Dixon, & Sleight, 2009). Nutrition education is now an established and urgent health promotion priority for all age groups (Anderson, Shapiro, & Lundgren, 2003). As mentioned earlier in Chapter 1, there has been no specific nutrition intervention especially the one to promote fruit and vegetable consumption targeting university students while college years are the time when many people begin to form lifestyle behavior patterns that strongly influence adult behaviors (Pearman & Valois, 1997). For many young adults aged 18 to 24 years as those in college years, this stage in life is the first chance to make their own food choices without parental influence (Keim, Stewart, & Voichick, 1997). During the transition from adolescence to young adulthood, the intake of fruit and vegetable tends to decline, and national survey data indicate that few young adults consume the recommended amounts (Larson, Neumark-Sztainer, Harnack, Wall, Story, & Eisenberg, 2008). Research suggest that life style habits such as food intake during young adulthood may have long-term health implications, and the food intake during young adulthood is not as nutritionally sound as desired (Hertzler & Frary, 1992; Beerman, 1991; Larson et al., 2008). Many university students are occupied with busy lifestyles, spending time in classes, social activities, peer groups, and other irregularly organized activities, and their dietary behaviors are based on rituals, convenience, and social influence. Additionally, young adults are often ambivalent about their future health and the role that nutrition plays. Due to the absence of chronic medical conditions in this age group, little attention has been focused on the diets of 18-year-olds to 24-year-olds. Nutrition education to

motivate young adults to consume more fruit and vegetables would represent a way to avoid the development of body weight problems and chronic illness in the long run.

In addition, nutrition education currently provided among Thai population is simply a basic knowledge-based campaign targeting at general population while health behaviors such as dietary behaviors are concerned with many determinants including psychological constructs and behavioral tool such as self-efficacy and planning. Determinants of the reasons why people engage in health promoting behaviors can be described by social-cognitive health behavior models. Current health behavior models, such as HAPA model, have been successfully applied in many studies undertaken with Western samples. Very few studies have been done in the contexts of Eastern societies.

Thus the main objective of this study is to apply HAPA model in an experimental study in Eastern culture by means of a training health intervention integrating both traditional basic nutrition campaign and the HAPA approach guided intervention. The present study is to test the efficacy of a nutrition intervention which is based on self-regulatory techniques as indicated in HAPA model. It is hypothesized that the adding of this theory-based intervention would reinforce the increased responses in desired nutrition behavior. This study aimed to employ three approaches of research methods to reach its objectives. A quantitative approach as a cross sectional study and a qualitative approach were utilized as the first step of Intervention Mapping to obtain some useful information for designing a nutrition intervention. An experimental design was used to explore the effects of theory-guided intervention among target group.

Chapter 3

Method

This chapter demonstrates a methodological explanation of study process for this current study. Study procedures can be roughly divided into two parts as follows;

1. Preparation Phase

The author reviewed the relevant literatures about health theories to be used in this study, designing an intervention, Intervention Mapping and conducted a cross sectional survey and focus group study to obtain some necessary information for designing a nutrition intervention (as detailed in the Intervention Mapping process mentioned in this Chapter). After that, along with an intervention plan, a research assistant team was set. The matrix of performance objectives, determinants, change objectives, theoretical methods and strategies was created.

2. Experiment Phase

The author advertised the intervention program, recruited and randomized participants into intervention and active control groups. Two nutrition intervention programs were implemented in both groups. Pretest, posttest and follow up assessments were assigned. Scales and measures used in this intervention study were tested by the means of online survey.

The concept of Intervention Mapping was employed and was described in this chapter. Study design in this research covers quantitative design, qualitative design and experimental design. The detail of each topic will be respectively described as follows;

3.1 Intervention Mapping as a guideline of nutrition intervention

3.2 Quantitative design

3.3 Qualitative design

3.4 Experimental design

3.1 Intervention Mapping as a Guideline of Nutrition Intervention

As nutrition intervention will be included as a part of this study, the designing of the intervention focusing on dietary behavior among university students will be described using the concept of Intervention Mapping as a guideline. There are six steps in Intervention Mapping. Within each step, specific tasks are performed which will guide the decision making process. Below is a figure showing outline of each of the Intervention Mapping step and its detail applied to this study will be presented afterwards.

Step 1: Conduct a Needs Assessment	
Tasks	<ul style="list-style-type: none"> • Assess health behaviors among target group • Plan needs assessment or problem analysis
Step 2: Develop Intervention Objective Matrices	
Tasks	<ul style="list-style-type: none"> • State expected changes in behavior • Specify performance objectives • Specify determinants of the target behavior of the risk group • Create matrices of change objectives
Step 3: Develop Theory-Based Methods and Practical Strategies	
Tasks	<ul style="list-style-type: none"> • Identify theoretical methods • Choose program methods • Translate intervention into practical strategies
Step 4: Design an intervention program	
Tasks	<ul style="list-style-type: none"> • Create program scope, sequence, theme, and materials list • Develop design documents • Review available materials • Develop program materials • Pretest program materials with target groups
Step 5: Adoption and Implementation	
Tasks	<ul style="list-style-type: none"> • Select methods and strategies • Deliver intervention to target participants
Step 6: Develop Evaluation Plan	
Tasks	<ul style="list-style-type: none"> • Develop methods for evaluating effectiveness of the program (outcome)

Figure 4 Intervention Mapping Framework (adapted from Bartholomew et al., 2006)

Step 1: Conduct a Needs Assessment

The target participants for the intervention were university students. The decision to focus the intervention on this group of students because this group is regarded as one of the risk group due to their changing life styles and eating behaviors including declination of dietary behavior in fruit and vegetable consumption (Larson et al. 2008). The objective of the needs assessment was to explore the health status, health behavior, nutrition behaviors and perceptions of university students of health behaviors and implications for nutrition intervention. The needs assessment was conducted to explore health behaviors among university students. It was also to assess the feasibility of performing the Intervention Mapping process for this study. The needs assessment was conducted by two studies. The first study was a cross sectional study on health status and health promoting behaviors of Thai University students. The second study was a qualitative study using focus group discussions to explore students' perception of health, nutrition behaviors, need and implications for nutrition intervention. Qualitative methods are regarded important in program planning. The decision to use one method over another is influenced, in part, by what kind of information the program needs, and on the context of the program and its participants (Farquhar, Parker, Schulz, & Israel, 2006). University student participants were recruited for this needs assessment studies (Detail of the findings of two studies will be described in this chapter and in Chapter 4).

Step 2: Develop Intervention Objective

Based on the previous step, literature review and results of the cross sectional study in needs assessment, it is hypothesized that nutrition intervention emphasizing on promoting fruit and vegetable consumption should be done in the group of those

students who did not routinely perform proper nutrition behaviors. In this step, the result from the needs assessment and integrated theoretical framework were used to specify nutrition behavior that would be promoted after the intervention. Performance objectives and change objectives were listed. Since there has never been any nutrition intervention targeting dietary behaviors among university students before, the process of developing intervention objectives and methods started with the analysis of existing health and nutrition campaigns provided by Nutrition Bureau of Ministry of Public Health of Thailand. These campaigns were reviewed with regard to the degree to which they cover all the required knowledge about general nutrition guidelines. It emerged from the review of existing nutrition campaigns in Thailand that they covered all the required information about general nutrition guidelines and fruit and vegetable consumption. Many newly launched campaigns in recent years have focused on both nutrition and physical activities to prevent and deal obesity problems in Thailand. However, they were knowledge-based and lacked of behavioral tools such as theory-guided behavioral constructs to facilitate changes in desired behaviors. The main objective of most of the nutrition campaign reviewed in Thailand focuses on knowledge and information of dietary guidelines.

Therefore, in designing nutrition intervention to promote fruit and vegetable for the target group, the Health Action Process Approach (HAPA) (Schwarzer, 2008) is applied as a core theory for this intervention. Some theory-based psychological constructs, then, were added as behavioral tools assuming to help promoting the desired behavior. Determinants of these performance objectives therefore included knowledge about nutrition and fruit and vegetable consumption, risk perception, outcome expectations, perceived self-efficacy, and planning.

Step 3: Develop theoretical methods and practical strategies

Theoretical methods and practical strategies for creating change in the determinants were proposed in this step. With the research assistants, all of the change objectives created in former step were organized according to the determinants they were associated with. Methods and strategies used to change determinants were brainstormed and discussed.

A review of the theoretical and empirical literature produced some useful methods which can influence the identified determinants: transfer of information (for basic knowledge about nutrition guidelines and risk awareness), brainstorming (for positive outcome expectations), verbal persuasion, mastery experience, modeling (for self-efficacy), group discussion and worksheets (for facilitating planning skills). (Detail will be presented in Figure 7 in page 80).

Step 4: Design an intervention program

A healthy nutrition training intervention was used as a typical health educational session for this study. Intervention materials guided by the objectives and concepts about methods and strategies were designed based on information in needs assessment and the latter steps. The intervention comprised of 4 main parts delivered in various methods such as teacher presentation, group discussions, and class assignments. Intervention team gathered all the content that should be included in the program materials and elaborated the content. The materials used included visual messages and pictures presented by power point presentation, handouts, worksheets and exercises designed to be used appropriately in each topics. These materials and documents were rechecked with objectives and methods to ensure that change objectives have been addressed.

Step 5: Adoption and Implementation

Before this step, a plan for implementation and adoption was designed at the intervention conception phase. The plan involved implementation objectives, methods, and strategies. Before delivering the intervention, a training session for the research assistants was developed to ensure that the intervention procedures would be undertaken as planned. Selecting of suitable teaching and learning materials were prepared. After recruiting participants, the intervention training session was provided to target participants. Research assistants and the author were responsible for implementation the intervention. Training intervention activities were also included administration of pre-test and post-test assessments aiming to measure amount of fruit and vegetable consumption among target participants.

Step 6: Develop Evaluation Plan

This step was used to determine whether decisions made about learning and change objectives, methods, and strategies were correct at each mapping step through intervention program monitoring and evaluation. The outcome of the intervention was measured whether or not the intervention has been implemented as planned and the learning objectives were achieved and whether the determinants of the health promoting behavior (fruit and vegetable consumption) have been adopted.

Methodological detail about quantitative design and qualitative design will be provided as they are parts of need assessment of Intervention Mapping. Finally, this chapter will end with methodological description of experimental design and data analysis.

3.2. Quantitative Design: Health Status, Health Promoting Behaviors and Nutrition Behaviors of Thai University Students: A Cross Sectional Study

This cross sectional study has been undertaken for two objectives. First, the descriptive result of this cross sectional study on health status, health promoting behaviors and nutrition behaviors will be used as a part of the need assessment for nutrition intervention. Second, the result from this cross sectional study will be used to explore the mediating effect of self-efficacy and planning.

3.2.1 Participants

Participants were 1,718 university students from four public universities located in four regions of Thailand; Chiang Mai University (North), Khon Kaen University (Northeast), Kasetsart University (Central), and Prince of Songkhla University (South).

3.2.2 Data Collection Procedure

During December 2008 to January 2009, the questionnaires were administered to a convenience sample of 2,000 university students. Data were collected by the help of administration staffs from student affair divisions of each university who administered surveys and collected data. Participants were recruited at their universities. After having given informed consent, participants were informed about study objectives and confirmed confidentiality. They were asked to complete six questionnaires assessing health status, general self-efficacy, dietary behavior, fruit and vegetable consumption, intention to engage in healthy eating behavior, and planning to change diet behavior. All participants were fully informed about the purpose and

nature of the survey and what participation required of them. The questionnaires were voluntary, anonymous self-reported and took approximately 15 minutes to complete. A total of 2,000 questionnaires were distributed to undergraduate students in four universities (500 questionnaires for each). Incomplete questionnaires were discarded. As a result, only 1,718 questionnaires were analyzed for this study.

Table 1 Demographic Information of Participants (N = 1,718)

Demographic information		<i>n</i>	%
Sex	Male	798	46.5
	Female	917	53.5
University	Prince of Songkla university	477	27.8
	Chiang Mai university	402	23.4
	Kasetsart university	438	25.5
	Khonkaen university	401	23.3
Academic year	First	491	28.6
	Second	564	32.8
	Third	330	19.2
	Fourth	332	19.3
Fields of study (grouping into three groups)	Science and technology	540	31.4
	Health Sciences	258	15.0
	Humanities and social sciences	920	53.6

Note: **Science and technology** was grouped from faculties of Sciences, Agriculture, Agro industrial, Engineering, and Media technology
Health science was grouped from faculties of Medicine, Traditional medicine, Nursing, Dentistry, Associated medical science, veterinary medicine, Pharmacy, and Architecture
Humanities and social sciences was grouped from faculties of Humanities, Social sciences, Political sciences, Economics, Business administration, Law, management science, Arts, Mass communication and Education

From Table 1, there is an overview of demographic information of the participants. A total of 1,718 students responded, of whom 917 were women (53.5%).

They studied in the first (28.6%), second (32.8%), third (19.3%), and fourth (19.2%) academic year in the areas of Humanities and social Sciences (53.6%), Science and Technology (31.4%), and Health Sciences (15%). Their mean age were 20 years (SD = 1.4) with a range from 17 to 30 years.

3.2.3 Measures

The following section presented the measures used in this cross-sectional study. Participants completed a self-report questionnaires that included measures of health status, general self-efficacy scale, Health Promoting Lifestyle Profile II (HPLP II), dietary behavior, intention to engage in healthy eating behavior, and planning to change diet behavior. The survey also included a demographic information form. All scales were translated by a language professional and a psychologist to be used by Thai university students.

Self Ratings of health status

The self ratings of health status scale consist of 2 items measuring the perception of one's health with and without comparison with others. This scale was adopted from Weinstein (1987). Items in this scale rated from 1 to 5. Correlation coefficient between two items is .42.

The general self-efficacy scale

The scale was created to assess a general sense of perceived self-efficacy with the aim in mind to predict coping with daily hassles as well as adaptation after experiencing all kinds of stressful life events (Schwarzer & Jerusalem, 1995). The general Self-efficacy scale is a 10-item inventory that measures self-efficacy; that is,

it measures the degree of confidence individuals have in their ability to perform specific behaviors (Cronbach's alpha = .89). Items in the questionnaire rated from 1 = Not at all true, 2 = Hardly true, 3 = Some what true, 4 = Moderately true, 5 = Very true, and 6 = Mostly true.

Health-Promoting Lifestyle Profile II (HPLP II)

The HPLP-II is a self-report inventory that measures the degree to which participants engage in an overall health-promoting lifestyle (Walker, Sechrist, and Pender, 1987). The HPLP-II is used to measure health-promoting behaviors, conceptualized as a multidimensional pattern of self-initiated actions and perceptions that serve to maintain or enhance the level of wellness, self-actualization, and fulfillment of individuals. This questionnaire is composed of 52 items and contains six subscales of health-promoting lifestyle, which are intended to measure a healthy lifestyle:

- Health responsibility
- Physical activity
- Nutrition
- Interpersonal relations
- Spiritual growth
- Stress management

Items in the profile are worded as positive actions or perceptions directed toward enhancing health and well-being such as "Getting enough sleep" "Take some time for relaxation each day". Items in the scale rated from 1 = never, 2 = sometimes, 3 = often to 4 = routinely. The items are clearly oriented toward avoidance or prevention of illness.

The inventory's alpha coefficient for reliability is .91. Adequate Cronbach's alphas for the subscales were ranging from .65 to .80.

Dietary behavior

Self-reported dietary behavior was adapted from the nutrition style scale developed by Renner, Hahn, and Schwarzer (1996). The dietary behavior was assessed by a six-item scale that targeted a low-fat diet (Cronbach's alpha = .62). Items in the questionnaire rated from 1 = Not at all true, 2 = Hardly true, 3 = Some what true, 4 = Moderately true, 5 = Very true, and 6 = Mostly true.

Intention to engage in healthy eating behavior

Behavior intentions are explicit decisions to act in a certain way. Intention to engage in healthy eating behavior was developed by Renner et al. (1996). Participants completed one single item scale as a nutrition-specific intention measure. The question asked "I intend to eat less fat". Item rated from 1 (Not at all true) to 6 (Mostly true).

Planning to change dietary behaviors

Planning was assessed by one item asking "I planned exactly when and how I will change my dietary behaviors." Item was a six-point scale ranging from 1 (Not at all true) to 6 (Mostly true).

This cross sectional study has been undertaken and yielded some result which would be described in Chapter 4. Meanwhile, the qualitative approach has also been designed to gain some implications for nutrition intervention.

3.3 Qualitative Design: Use of Focus Groups to Explore Thai University Students' Perception of Health and Nutrition Behaviors: Implications for Nutrition Intervention

This study included a qualitative design, with the use of focus groups, sought to gain a better understanding of the perception of health behaviors, nutrition behaviors, factors that may influence food choices and also to assess the need for future nutrition intervention among university students. Focus group method can be regarded an effective way of collecting qualitative data from relatively homogenous populations about attitudes, perceptions, and opinions that may influence important behaviors. The group format fosters self-disclosure from participants and idea generation via group interaction (Krueger, 1994).

3.3.1 Participants

Full time 34 university students in Chiang Mai province area were eligible to participate in the pre intervention focus group discussions aiming to obtain some useful information to develop appropriate message content, and strategies to be used in nutrition intervention. Subjects were recruited through a personal announcement in the class rooms of psychology for daily life. Topics of discussion were mentioned in this announcement, but the specific goals of the study were not described.

Focus group participants consisted of 34 students, 16 men and 18 women. Ten students were studying in first academic year, 10 in third year, 8 in second year and 6 in fourth year. Eight students were majoring in Humanities, 8 students in Education, 7 students in Architecture, 6 students in Science and 5 students in Arts.

3.3.2 Focus Group Procedures

All focus groups were held at the university at a time determined to be convenient for the students which was at 4.00 P.M. on different days of the week. Seven to ten students participated in each focus group. They participated in four focus groups to discuss their perceptions and practice of health behaviors, nutrition behaviors, factors that may influence the healthy eating behaviors and the need for future nutrition intervention using a set of semi structured questions to guide the 1.5 hours group discussions. All focus group discussions were taped and transcribed.

3.3.1 Question Guideline

In each focus group, series of questions about health behaviors, nutrition behaviors and need for health education (nutrition intervention) were asked. Focus-group questions were developed by researcher and an assistant and were piloted with a convenience sample of students from the class of Psychology for daily life. Key questions centered on how students perceive their health behavior, nutrition behavior, factors that influenced students' food choice, and barriers to perform nutrition behaviors.

Participants also were asked to share their ideas on the nutrition intervention in the future. A semi structured interviewing questions were used to ensure consistency across groups while also allowing flexibility for student participation level. Probes were used to elicit further discussion on responses.

Main categories	Questions
Perception of health behaviors	<ul style="list-style-type: none"> - What is the meaning of health behaviors to you? - How important of health behaviors to you? - Which health behaviors you are undertaking?
Nutrition behaviors	<ul style="list-style-type: none"> - Factors you view as influencing your food choices. - Think of the foods typically found in your environments (home, university, grocery stores, food centers, etc.) and how you would describe them in term of healthy or unhealthy. - Which nutrition behaviors you are undertaking?
Need for nutrition intervention	<ul style="list-style-type: none"> - Have you been in any health education program before? - Do you need health education on nutrition behaviors? - What type of intervention you prefer? (e.g. training, printed information, on line intervention, individual counseling) - Have you ever heard of or experience in any online intervention?

Figure 5 General Guideline of Questioning Used in the Focus Group Discussions

3.3.4 Conducting Focus Group Discussions

All four focus group discussions involved mixes of male and female students. Focus group discussions were carried out in Thai Language. Each discussion group was conducted in a small class room at the Department of Psychology, Chiang Mai University. All group discussions were held in a round-table format with participants facing to one another. The content of the focus group discussions was related to participants' perception of health behaviors, nutrition behaviors, and the need for future nutrition intervention. The participants were asked, at the beginning before

each session starts, to complete a short questionnaire on the demographic information; namely, sex, academic year, and faculty.

Participants were told to be comfortable talking in front of their peers and participating in a group discussion about health and nutrition behaviors. Participants in each group knew each other from the same courses they have taken. They were not very different in terms of academic year and field of study. Carey (1994) recommended that focus groups should be homogeneous in terms of age, status, class, occupation and other characteristics, as they will influence whether participants interact with each other.

3.3.5 Data Collection

Focus groups followed the semi structured guide of questioning shown in Figure 1. The questions were open-ended, neutrally presented, conversational, clear and concise. Probes were used to gain specific and detailed information. Discussions were audio-taped and transcribed. Responses were also recorded on papers, and the transcripts were compared to these written notes.

3.3.6 Focus Group Discussion Analysis

Transcribing the audiotapes was used. Another research assistant helped with the transcribing which was most useful either when there were many tapes to be compared or when the content of each discussion needs to be examined in careful detail. As a validity check, a summary report of the major findings was prepared and reviewed by another research assistant (Neumark-Sztainer, Story, Perry, & Casey, 1999). Content and discourse analysis were performed to identify the perceptions and related factors. Direct quotations were also captured and were presented in italic

under each topic. To control for possible bias, all transcripts were reviewed independently by another research assistant. The selection of categories and themes also was verified by independent review. There was a high level of concordance between reviewers.

3.4 Conclusion of Two Studies as Input for the Need Assessment

The findings from cross sectional study indicated that Thai university students performed main health promoting behaviors only for sometimes (e.g. physical activities, nutrition and stress management). They were not routinely engaged in health promoting behaviors. In the sub scale of Nutrition, consumption of diet low in fat and fruit and vegetable were not performed routinely. And participants also reported relatively low healthful lifestyle in health responsibility especially in attending health educational program (More detail will be presented in Chapter 4). A review of related literature indicated that Thai people including this age group did not engage in sufficient fruit and vegetable consumption according to daily recommendation as suggested by WHO and Thailand's nutrition flag. Result from focus group discussion also indicated that a nutrition intervention was needed and should be provided to this group of people. According to type of nutrition intervention, classroom-based intervention was one of the most preferred health educations among these students. This finding was supported by a study of Jepson, Harris, Platt, and Tannahill (2010) which reviewed the effectiveness of interventions to change six health behaviors. The study included 103 reviews published between 1995 to 2008. Some of those interventions were designed to change an existing behavior (e.g. smoking, alcohol misuse) while some interventions were designed to promote positive behaviors (e.g. healthy eating). The findings indicated that one of

interventions that was most effective across a range of health behaviors included workplace- and school-based activities. Health educationists should, therefore, consider a training intervention as important tool for implementation of a health education program.

Classroom-based training allows many participants to train at one time. Many strategies and teaching methods can also be included in the session. Therefore, in this study, a one day brief nutrition intervention plus self-efficacy and planning with a classroom-based training session and class activities was selected to be used in this study. Lecture with presentation, small group discussion, worksheets assignments and class activities were employed as training methods. Detail will be presented later in this chapter.

3.5 Experimental Design: A Theory-Based Intervention Study

The study is designed as a randomized controlled trial to examine the effects of the theory-based intervention in comparison to an active control group. It is expected that the intervention group not only scores higher in intentions, self-efficacy, and planning, but also reports higher levels of fruit and vegetable consumption later on.

3.5.1 Participants

Participants for this intervention study were undergraduate students of Chiang Mai University, Thailand, attending the General Psychology course in the second semester of the academic year 2009. They were invited to participate in a health intervention program. Inclusive criteria were as follows;

- They had NOT received any other form of nutrition education in the last 6 months.
- They consumed less fruit and vegetable than daily recommendation.
- They were non vegetarians.

A total of 121 eligible university students were interested in participating in the study. Participants were assigned to one of two conditions using random sampling numbers without replacement: a self-efficacy and planning intervention (intervention group, $n = 61$) or a health education session (active control group, $n = 60$). Five students dropped out, and two were lost in the follow-up, resulting in a final data set of 114 participants.

After giving informed consent, participants took the Time 1 (T1) baseline assessments. One week and six weeks later, respectively, participants were invited to the Time 2 (T2) posttest and Time 3 (T3) follow-up assessments. To prevent attrition, eight gift vouchers were offered in a sweepstakes as an incentive to those who completed either the intervention or health education program, and who also responded to all questionnaires at three points in time. This 500 baht voucher was a good incentive, since average income of students per month is approximately 4,000 Baht. Additional small tokens, such as booklets on healthy nutrition and weight management, were given to those who completed the program. Demographic details for participants are given in Table 2.

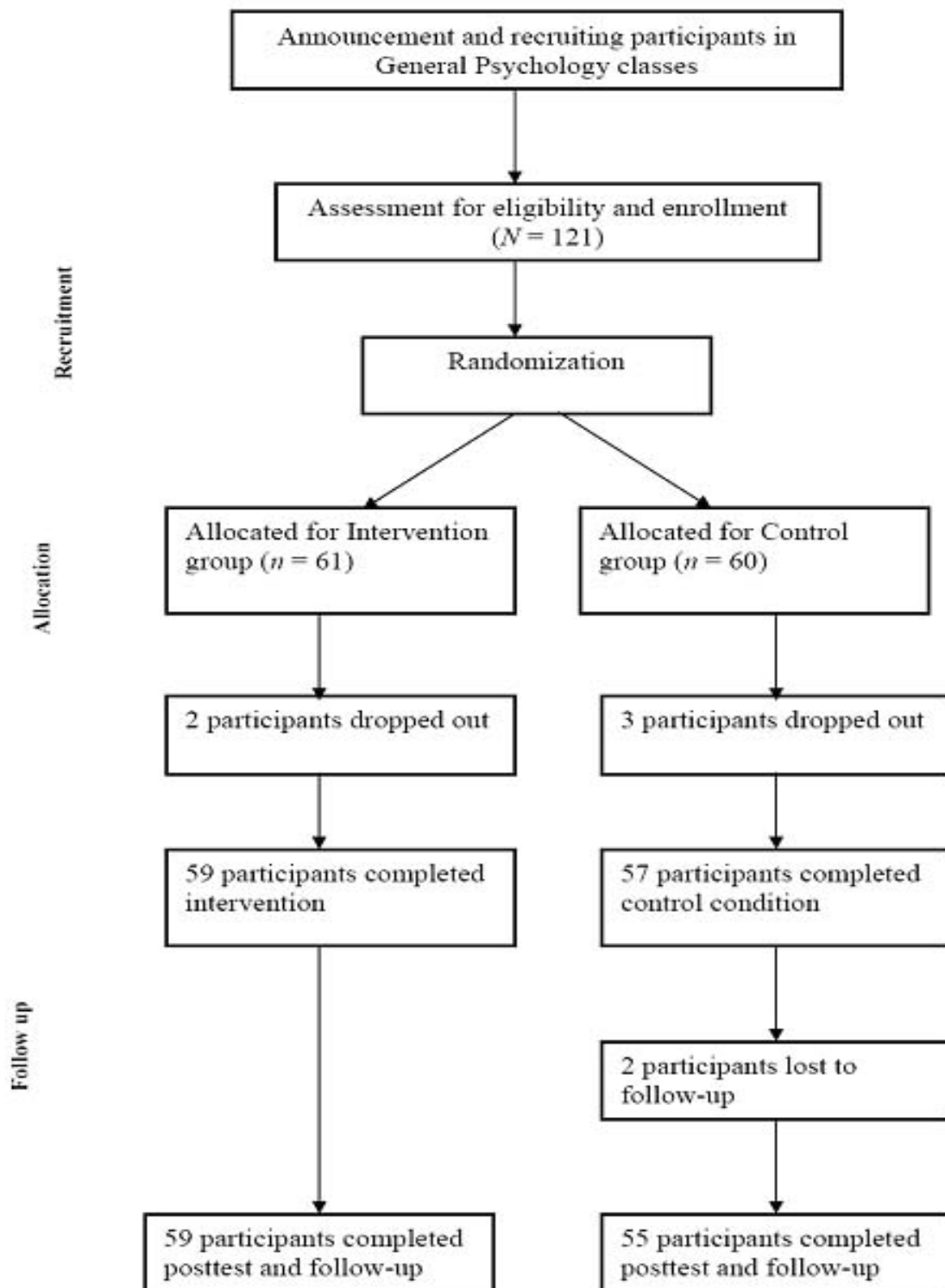


Figure 6 Study Flowchart with Numbers of Participants Who Attended the Intervention and Control Conditions

An overview of demographic information of the participants in two experimental conditions is briefly described in the table below. Their mean age were 20.2 years (SD = 1.31) with a range from 18 to 25 years.

Table 2 Demographic Characteristics in the Two Experimental Conditions

	Intervention (N = 59)		Active control condition (N = 55)	
	<i>n</i>	%	<i>n</i>	%
Sex				
Men	29	49.2	29	52.7
Women	30	50.8	26	47.3
Academic year				
First	39	66.1	22	40
Second	20	33.9	33	60

3.5.2 Measures

Participants completed a self-report questionnaires that included measures of Fruit and vegetable consumption, Risk perception, Outcome expectations, Intention, planning, and Perceived dietary self-efficacy. All measures had been validated in previous studies (Luszczynska et al., 2007; Schwarzer, 2008). They were translated into Thai by the author in collaboration with a professional interpreter. Linguistic equivalence was attained by back translations.

3.5.3 Test of Measures Used in Experimental Design

All measures to be used in this experimental design were tested by relatively similar group of people using online survey format. More than 1,000 university students from many institutes in every regions of Thailand took this online survey. An online questionnaire was created and was advertised using various sources of advertisement such as posting a message in two affiliate websites for variety topics of

Thailand, one health related website, three university message boards, and small advertising flyers given to students in undergraduate seminars in 12 universities and colleges. After giving informed consent, participants filled the online questionnaires. Undergraduate students from many universities and colleges in Thailand participated in this online survey. The recruitment and participation of this online survey took place for 6 months from August during the mid of first semester of academic year 2009 to January 2010.

There were 1,805 university students who participated in the online survey but only 911 students who filled online questionnaire completely without skipping any parts.

Fruit and vegetable consumption was measured by two items: “How many servings of fruit (e.g., bananas, pineapples) have you eaten on average per day? Think of your consumption in the previous week,” and “How many portions of vegetables (e.g., cabbage, lettuce) have you eaten on average per day? (A serving of fruit and vegetable was defined as one handful of fruit and vegetable. A serving could be equal to medium piece or two small pieces of fruit, or one cup of diced pieces; a serving of vegetables was defined as ½ cup of cooked vegetables or one cup of salad vegetables) Think of your consumption in the previous week” (open-ended response format). Correlation between the two items was $r=.64$.

Risk perception was measured by four items adopted from Perloff and Fetzer (1986). Participants were asked to estimate the likelihood of getting one or more of health problems during their lifetime. (e.g. “How likely is it you will have a sometime

in your life a high cholesterol level?") All items had a 6 - point scale response format. Cronbach's alpha was .84.

Outcome expectations were measured by twelve items. Six items assessed positive outcome expectations (e.g., "What will be the consequences if you change your nutrition to more fruit and vegetable?" After this header, responses were elicited to specific questions, such as: "If I eat more fruit and vegetable, that will be good for my cholesterol level") and six items assessed negative outcome expectations (e.g., "What will be the consequences if you change your nutrition to more fruit and vegetable?" After this header, responses were elicited to specific questions, such as: "If I eat more fruit and vegetable, I will have to spend more time on preparing meals"). All items had a 6 - point scale response format. Cronbach's alpha was .63.

Intention to consume fruit and vegetables was measured by two items "How many servings of fruit (e.g., bananas, pineapples) do you intend to eat every day?" and "How many servings of vegetables (e.g., cabbage, lettuce) do you intend to eat every day?" (open - ended response format). Correlation between the two items was $r=.72$.

Planning to change nutrition habits was measured by three items for action planning (e.g., "I have concrete plans when, where, and how to eat which kind of fruit and vegetables.") and three items for coping planning (e.g., "I have concrete plans when, where, and what to do in difficult situations to stick to my intentions." All items had a 6-point scale response format. Cronbach's alpha was .84 for action planning, and .83 for coping planning.

Perceived dietary self-efficacy was measured by two items with a 6-point scale response format: “I am confident that I can eat five servings of fruit and vegetables a day,” and “I am confident that I can eat enough fruit and vegetables daily, even when there are no attractive shopping opportunities.” Correlation between the two items was $r=.55$.

An overview of demographic information of the participants in online survey is briefly described here. A total of 911 students responded, of whom 606 were women (67.4%). They studied in the first (41.7%), second (16.6%), third (32.9%), fourth (8.6%), and fifth (2%) academic year. Their mean age were 20.20 years (SD = 2.27) with a range from 17 to 47 years.

Table 3 Means (M), and Standard Deviations (SD) of All Variables (N = 911)

Variables	M	SD
Fruit and vegetable consumption	2.93	1.48
Risk perception	2.87	1.18
Outcome expectations	4.23	.61
Intention	3.63	1.38
Planning	3.94	.99
Perceived dietary self-efficacy	4.06	1.23

3.5.4 Intervention conditions

The author designed the intervention content promoting fruit and vegetable based on reviewing related literature (e.g. health behavior change theory, previous studies and findings from preliminary cross sectional and qualitative studies). These documentation were used as parts of Intervention Mapping which worked as guidelines for developing an intervention.

The study was a two-group randomized controlled trial comparing a theory-based psychological intervention with a nutrition education session. The intervention group received a one-day training program, whereas the active control group received a health education lesson for 2.5 hours. The intervention took place at the Faculty of Humanities, Chiang Mai University, Thailand.

The goal of the intervention was to consume five servings of fruit and vegetable per day as recommended, and participants were made conscious of their deficits in fruit and vegetable consumption. The intervention took place on a weekend and started with a brief overview of nutrition information based on Thailand's nutrition guidelines (MOPH, 2000b), presented by a trained lecturer in the field of nutrition from a vocational college. After this 2.5 hours introduction, the program for the active control group was completed.

The intervention group then received a psychological program that was based on the Health Action Process Approach (Schwarzer, 2008) that addresses self-efficacy and strategic planning. Self-efficacy enhancement was stimulated by recalling mastery experience, by modeling, and by persuasion (Bandura, 1997). Two kinds of planning skills were practiced, action planning and coping planning. Participants received prepared action planning sheets and were asked to generate a detailed plan when, where, and how they intended to consume fruit and vegetable. They were also asked to specify which particular kind of fruit and vegetable they planned to consume at certain occasions. Types of fruit and vegetable were urged to be discussed among participants because there were various kinds of fruit and vegetable. Some kinds of fruit were exceptions such as durians, jackfruit and those preserved as sweetened dried fruits. Similarly, some kinds of vegetable were as well exceptions such as potatoes, yam, and taro which contain too much starch and energy

content. The focus was on green leafy vegetable and low sugar fruit. Moreover, they received prepared coping planning sheets that required them to imagine situations where barriers might emerge that would prevent them to act as previously planned. In discussion groups, students shared their experience with intentions and barriers, and they learned how to recover from setbacks. Nutrition calendars were introduced to help them practice how to make a weekly plan and a general nutrition planner. Handouts to assist future planning were also provided so that participants could generate action plans (such as to plan which fruit and vegetable to eat, when, how, and which amount) and coping plans (such as to anticipate possible barriers, find coping strategies, and how to get back on track after being derailed) (See examples of training materials in Appendix B).

Performance objectives	Determinant	Change objectives	Theoretical methods	Strategy
Have more knowledge about fruit and vegetable consumption	Knowledge	<ul style="list-style-type: none"> - Be able to tell which and what types of fruit and vegetable to be consumed. - Know the meaning of “portion” or “serving” means in how to measure the amount of fruit and vegetable consumed. - Know the daily amount of fruit and vegetable consumption as recommended by WHO and Thai Nutrition Flag. 	- Lecture (Persuasive communication)	<ul style="list-style-type: none"> - Illustration - Presentation
Aware of health risk for not consuming fruit and vegetable as recommended and of positive outcome of fruit and vegetable intake.	- Risk perception	- Enlist the possible risk for not consuming fruit and vegetable as recommended.	- Lecture (Persuasive communication)	<ul style="list-style-type: none"> - Illustration - Presentation - Brainstorming
	- Positive Outcome expectations	- Increase recognition of importance of fruit and vegetable consumption on health.		
Have competency and overcome barriers to increase consumption of fruit and vegetable.	<ul style="list-style-type: none"> - Knowledge - Self-efficacy 	<ul style="list-style-type: none"> - Express confidence in increasing fruit and vegetable consumption per day. - Identify barriers and suggest ways to overcome them. - Have confidence in ability to overcome barriers. 	<ul style="list-style-type: none"> - Mastery experience - Verbal persuasion - Modeling 	<ul style="list-style-type: none"> - Verbal presentation - Write down successful experiences. - Enlist possible barriers and suggest ways to overcome them. - Have role model stories of people successfully managing to change their dietary behaviors.

Figure 7 Matrix of Performance Objectives, Determinants, Change Objectives, Theoretical Methods and Strategies to be Used in Intervention Group

Performance objectives	Determinant	Change objectives	Theoretical methods	Strategy
Be able to make plans to increase amount of fruit and vegetable consumption.	- Action planning	- Make plans, stating when, where and how, to engage in fruit and vegetable consumption as recommended.	- Guided practice assignments - Small group discussion - Modeling	- Planning worksheets and nutrition calendar.
	- Coping planning	- Make plans on how to deal with anticipated barriers.		- Think of possible barriers and write them down. - Suggest ways to overcome those barriers. - Have role model successfully managing to overcome barriers.

Figure 7 Matrix of Performance Objectives, Determinants, Change Objectives, Theoretical Methods and Strategies to be Used in Intervention Group (Continued)

3.5.5 Major Methods Employed in This Nutrition Intervention

The major methods were employed in many fields of education. These methods can be applied to the teaching of health behavior change. Following are the summaries of the common teaching methods suitable for health intervention in this topic.

1. *Lecture method*

Lecture method is a quick, cheap and efficient way of introducing large numbers of students to a particular field of study. In this study, lecture was employed to provide information or knowledge about nutrition, fruit and vegetable's daily recommendation and the risk of insufficient fruit and vegetable consumption. Brainstorming was also used to elicit ideas and to promote participation.

2. *Small group discussion*

Small group discussion was used in this training session on planning to stimulate participants to think about the barriers that might possibly occur during planning. It encouraged participants to exchange

experiences and provided the opportunity to share ideas among one another.

3. *Mastery experience*

Mastery experience or performance accomplishments provide the most dependable source of efficacy expectations because they are based on one's own personal experiences.

4. *Verbal persuasion*

Verbal persuasion was used so that participants were led, through persuasive suggestion, in to believing that they can cope successfully with what has overwhelmed them in the past.

5. *Modeling*

This process is more effectual when a person sees him- or herself as similar to his or her own model. If a peer who is perceived as having similar ability succeeds, this will usually increase an observer's self-efficacy. In this study, examples from one female and one male students from the same university were used as models successfully engaged in healthy diet behavior.

3.5.6 Data Collection

In this experimental design, data collection proceeded as follows;

- Baseline data collection for time point 1 for both groups were assessed before the intervention.
- One week and six weeks after the intervention, the post-test (Time point 2) and the follow-up assessments (Time point 3) were collected.

3.6 Data Analysis

The data were analyzed using the SPSS statistic software version 17. Descriptive statistics, including frequencies, means and standard error, Pearson's correlation, Cronbach's alpha coefficient were employed as general analytic procedures to describe the demographic profile of participants and research variables such as fruit and vegetable consumption and other psychosocial characteristics. To test the main hypotheses of the intervention study, Repeated Measure ANOVA was used to identify group \times time interaction effects. Independent t-test was performed to compare mean score of tested variables between intervention group and the control group before and after the intervention. Paired sample t-test was applied for the comparison of mean score of tested variables before and after the intervention in both the intervention group and the control group. Some hypotheses were concerned with the change of the desired behavior over the entire time frame of the study. Moderated mediation and Indirect or multiple mediation analysis (Preacher, Rucker, & Hayes, 2007; Hayes, 2009) were as well used. The MODMED macro by Preacher et al. (2007) were used to test moderated mediator model where self-efficacy was chosen as a moderator of the intention-planning-behavior relationship. And SPSS "Indirect" macro was also employed to examine the mediator effects (Hayes, 2009).

Chapter 4

Results

The present study was conducted to find out general information about health status, perceptions of health and nutrition behavior and the need and pattern of nutrition intervention desired among Thai university students and also it was aimed to find out the effect of the theory-based nutrition intervention on fruit and vegetable consumption among university students.

In this chapter, the overall findings of the study, both quantitative and qualitative results, are reported. The results of this study will be divided into three parts. The first part illustrates the result of quantitative design as descriptive data from cross sectional study. The second part presents the results from qualitative design; focus group discussions. The last part reports results of the experimental design and the hypothesis testing.

4.1 Result of Quantitative Design from Cross-Sectional Study

The first objective of the current study was to find out general information about health status and nutrition behavior among Thai university students. In this section, the results of the cross sectional study are reported. The main goal here was to obtain some information about health promoting behaviors of Thai students using HPLP-II. Fundamental information about health promoting behaviors in combination with result from qualitative design will be used for developing a health intervention. The descriptive statistics of all variables can be found in Table 4.

4.1.1. Descriptive Statistics

Table 4 Means (*M*), and Standard Deviations (*SD*) of all Variables (*N* = 1,718)

Scales	M	SD	Range
Self-rating of health	3.81	.72	1 - 5
Self-rating of health compared to other	3.00	.45	1 - 5
General Self-efficacy	3.87	.69	1 - 6
Health promoting lifestyle	2.53	.34	1 - 4
Dietary behavior	3.38	.75	1 - 6
Intention to engage in healthy eating behavior	3.65	1.33	1 - 6
Planning to change dietary behaviors	3.43	1.26	1 - 6

Analysing the descriptive statistics indicated that participants reported the moderately high evaluation of their own self rating of health without comparison to others' health status and moderate evaluation of health with comparison to other. For health promoting lifestyles, descriptive analysis showed that participants perform overall health promoting lifestyles in moderate level. The same patterns were found as well for its subscales of physical activities, nutrition, health responsibility and stress management and also were found in dietary behaviors.

Table 5 Means (*M*), and Standard Deviations (*SD*) of HPLP-II Sub Scales (*N* = 1,718)

HPLP-II Sub scales	M	SD	RANGE
Physical activities	2.24	.50	1 - 4
Nutrition	2.52	.44	1 - 4
Health responsibility	2.12	.47	1 - 4
Interpersonal relations	2.95	.44	1 - 4
Spiritual growth	2.84	.45	1 - 4
Stress management	2.50	.44	1 - 4

When take a close look at the subscales of health promoting lifestyles of participants, the results showed that participants have performed more often in sub scales of interpersonal relations ($M = 2.95$, $SD = .44$) and spiritual growth ($M = 2.84$, $SD = .45$). However, they have performed most of the health promoting behaviors in other sub scales only for sometimes (e.g., physical activities ($M = 2.24$, $SD = .50$), nutrition ($M = 2.52$, $SD = .44$), health responsibility ($M = 2.12$, $SD = .47$), and stress management ($M = 2.50$, $SD = .44$). In items of nutrition subscale, participants indicated moderate level of fruit and vegetable consumption which means that they have not routinely undertake these nutrition behaviors. Additional, participants rated lowest level in subscale of health responsibility, which is very important for individuals in aspect of examining themselves in terms of health or danger signs, seeking health information and advices or attending health educational program in order to maintain personal health care ($M = 1.89$, $SD = .80$).

Table 6 Means (M), and Standard Deviations (SD) of 52 Items in HPLP-II Sub Scales ($N = 1,718$)

HPLP-II subscales	M	SD
Physical activities (items number 4, 10, 16, 22, 28, 34, 40, 46)	2.24	.50
4. Follow a planned exercise program.	2.15	.80
10. Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber).	2.24	.89
16. Take part in light to moderate physical activity (such as sustained walking 30-40 minutes or more times a week).	2.36	.87
22. Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling).	2.24	.80
28. Do stretching methods to control my stress.	2.21	.82
34. Get exercise during usual daily activities (such as walking during lunch using stairs instead of elevators, parking car away from destination and walking).	2.77	.87
40. Check my pulse rate when exercising.	1.80	.81
46. Reach my target heart rate when exercising.	2.14	.91

Table 6 Means (*M*), and Standard Deviations (*SD*) of 52 Items in HPLP-II Sub Scales (*N* = 1,718) (Continued)

HPLP-II subscales	M	SD
Nutrition (items number 2, 8, 14, 20, 26, 32, 38, 44, 50)	2.52	.44
2. Choose a diet low in fat, saturated fat, and cholesterol.	2.27	.74
8. Limit use of sugars and food containing sugar (sweets).	2.16	.80
14. Eat 6-11 servings of bread, cereal, rice and pasta each day.	2.61	.80
20. Eat 2-4 servings of fruit each day.	2.52	.80
26. Eat 3-5 servings of vegetables each day.	2.63	.82
32. Eat 2-3 servings of milk, yoghurt each day.	2.47	.84
38. Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day.	2.80	.81
44. Read labels to identify nutrients, fats, and sodium content in packaged food.	2.66	.91
50. Eat breakfast.	2.57	.91
Health Responsibility (items number 3, 9, 15, 21, 27, 33, 39, 45, 51)	2.12	.47
3. Report any unusual signs or symptoms to a physician or other health professional.	1.95	.75
9. Read or watch TV programs about improving health.	2.27	.75
15. Question health professionals in order to understand their instructions.	2.02	.78
21. Get a second opinion when I question my health care provider's advice.	2.16	.78
27. Discuss my health concerns with health professionals.	2.07	.80
33. Inspect my body at least monthly for physical changes/ danger signs.	1.83	.80
39. Ask for information from health professionals about how to take good care of myself.	1.97	.79
45. Attend educational programs on personal health care.	1.89	.79
51. Seek guidance or counseling when necessary.	2.58	.81
Interpersonal Relations (items number 1, 7, 13, 19, 25, 31, 37, 43, 49)	2.95	.44
1. Discuss my problems and concerns with people close to me.	2.63	.81
7. Praise other people easily for their achievements.	3.17	.75
13. Maintain meaningful and fulfilling relationships with others.	3.23	.74
19. Spend time with close friends.	3.05	.78
25. Find it easy to show concern, love and warmth to others	3.22	.73
31. Touch and am touched by people I care about.	2.94	.83
37. Find ways to meet my need for intimacy.	2.54	.84
43. Get support from a network of caring people.	3.00	.82
49. Settle conflicts with others through discussion and compromise.	2.79	.80
Spiritual Growth (items number 6, 12, 18, 24, 30, 36, 42, 48, 52)	2.84	.45
6. Feel I am growing and changing in positive ways.	2.67	.76
12. Believe that my life has purpose.	3.27	.80
18. Look forward to the future.	3.35	.75
24. Feel content and at peace with myself.	2.95	.76
30. Work toward long-term goals in my life.	2.67	.82
36. Find each day interesting and challenging.	2.74	.81
42. Am aware of what is important to me in life.	2.97	.81
48. Feel connected with some forces greater than myself.	1.97	.90
52. Expose myself to new experiences and challenges.	3.01	.82

Table 6 Means (M), and Standard Deviations (SD) of 52 Items in HPLP-II Sub Scales (N = 1,718) (Continued)

HPLP-II subscales	M	SD
Stress Management (items number 5, 11, 17, 23, 29, 35, 41, 47)	2.50	.44
5. Get enough sleep.	2.69	.80
11. Take some time for relaxation each day.	2.77	.83
17. Accept those things in my life, which I cannot change.	2.87	.83
23. Concentrate on pleasant thoughts at bedtime.	2.70	.81
29. Use specific methods to control my stress.	2.22	.85
35. Balance time between work and play.	2.53	.75
41. Practice relaxation or meditation for 15-20 minutes daily.	1.87	.80
47. Pace myself to prevent tiredness.	2.27	.82

4.1.2. Intercorrelational Relationships

Table 7 Intercorrelations between Variables (N = 1,718)

Variables	1	2	3	4	5	6	7
1. Self-rating of health	1.00						
2. Self-rating of health compared to other	-.07**	1.00					
3. General Self-efficacy	-.06*	.13**	1.00				
4. Health promoting lifestyles	.01	.19**	.38**	1.00			
5. Dietary behavior	-.03	.11**	.28**	.33**	1.00		
6. Intention to engage in healthy eating behavior	-.01	.09**	.24**	.28**	.63**	1.00	
7. Planning to change dietary behaviors	-.04	.06*	.26**	.33**	.47**	.37**	1.00

* $p < .05$; ** $p < .01$.

Correlation coefficients showed no relation between self-rating of health without comparison to other with health promoting lifestyles and dietary behaviors. The correlations revealed the expected pattern of results. Intention to engage in health eating behavior was positively associated with self-efficacy and dietary behavior.

There were positive relations found between planning, general self-efficacy, intention, and dietary behavior. The relationship between intention and dietary behavior was relatively high ($r = .63$). This is probably due to the fact that intention was proposed as a proximal predictor of dietary behavior.

4.1.3. Moderated Mediation Analysis

In this section, a moderated mediator model was tested, where self-efficacy was chosen as a moderator of the intention-planning-behavior. MODMED macro Model 2 by Preacher et al. (2007) was tested.

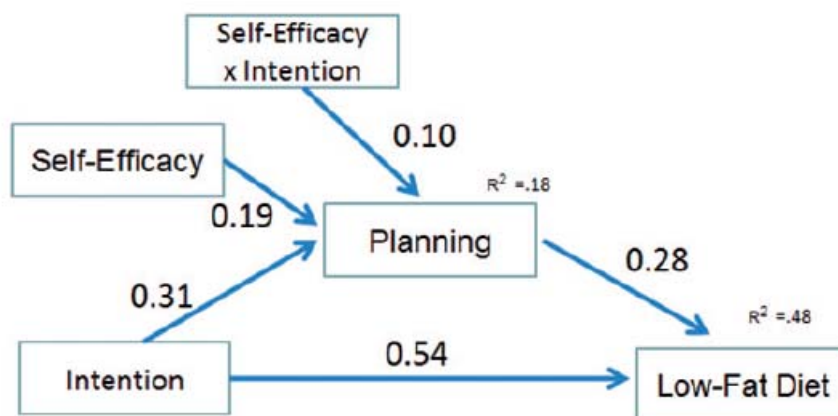


Figure 8 Moderated Mediation Model (All Coefficients $p < .01$)

The result indicated that self-efficacy moderates the planning-behavior relationship. First, planning was predicted by intentions ($B = 0.31$, $p < .01$), self-efficacy ($B = 0.19$, $p < .01$), and the interaction between intention and self-efficacy ($B = 0.10$, $p < .01$), accounting jointly for 18% of the planning variance. The significant interaction effect is a necessary condition for moderated mediation (Figure 8). Dietary behavior was predicted by intentions ($B = 0.54$, $p < .01$) and planning ($B = 0.28$, $p < .01$), which accounted for 48% of the variance in dietary behaviors. Planning

partially mediated the intention-behavior relation, and this mediation was moderated by perceived self-efficacy. That is, the higher the self-efficacy scores, the higher the indirect effect of intentions on behavior through planning.

4.2 Result of Qualitative Design from Focus Group Discussions

Focus group discussions method was selected as a mean of data collection in qualitative design. This was to explore how Thai university students perceive health behaviors and its importance, health behaviors they have been undertaken, healthy diet behavior and to investigate the need and pattern of nutrition intervention for university students to obtain some useful information in need assessment of designing a nutrition intervention.

4.2.1 Participants Characteristics

Participants were all undergraduate students consisting of 34 students, 16 men and 18 women. Ten students were studying in first academic year, 10 in third year, 8 in second year and 6 in fourth year. Eight students were majoring in Humanities, 8 students in Education, 7 students in Architecture, 6 students in Science and 5 students in Arts.

4.2.2 Perceptions of Health Behaviors

Most of the students discussed and agreed that health behaviors were 'behaviors and lifestyles that one performs, resulting in improvement of physical and mental health'. More than 20 students reported that health behaviors consisted of two main factors which were having regular physical activities and having proper diets (Diet guidelines following the Thailand's nutrition flag). Some students added up

behaviors like having sufficient rest and relax, having supplementary diets and vitamins, avoiding alcoholic drinks, caffeinated drinks such as coffee and cola. A few students reported managing stress properly such as meditation and relaxing techniques as one of health behaviors. However, almost every student agreed that health behaviors were very important to their lives. A few students reported that health behaviors are somewhat important but not necessary in their age.

Perceived meaning of health behaviors*
Behaviors/ lifestyles that promote physical and mental health ** Having regular physical activities.** Having proper diets (following the Thailand's nutrition flag).** Having sufficient rest and relax. Having supplementary diets and vitamins. Avoiding alcoholic drinks. Avoiding too much of caffeinated drinks. Managing stress properly.
Perceived importance of health behaviors*
Very important because health behaviors** <ul style="list-style-type: none"> - Help maintaining good health. - Help building immune. - Tend to promote longevity. - Help prolonging chance of genetic disease to occur. - Help promoting mental health. - Help promoting fitness. Less important <ul style="list-style-type: none"> - It is important but not so necessary in young age.
Health behaviors which are now undertaken by students*
Physical activities, exercising. ** Consuming healthy diet.** Avoiding smoking and alcoholic drinks. Sufficient rest and relax. Meditation. Stress reduction.
**Most important categories (discussed most frequently and with greatest intensity) *Listed in descending order of frequency discussed by students.

Figure 9 Students' Perception of Health Behaviors

4.2.3 Nutrition Behaviors

Factors Influencing Food Choices

For most students, good taste, appetite or food craving and cost were very important factors influencing their food choices. For good taste and appetite, across gender and fields of study, daily consumption of what they like such as fast foods, sweets, crispy snacks, pastries and carbonated drinks were common. Many of them reported 'eating these snacks everyday' as often as 2 or 3 times a day. Cost was reported as one important factor influencing students' food choices. The following passage gives an example of cost factor.

'I got my monthly expenses from my parents and it is not quite a lot. I have to be careful in what I pay each day. Though foods and snacks are considered necessity and pleasure for me, I still have to watch my payment on my food choices'. (one male student)

Convenience was one of influential factors because many students were living in campus dormitories with cafeteria in it. Additional, there were 2 big food courts in campus with variety of foods and snacks sold in low price for students, therefore some of them reported convenience as one very important factor. Many students, mostly girls, reported perceived benefits of food and appearance of cafeteria or food court as very influential factors on their food choices. For moderately influential factors, situation of eating such as eating with friends or family was mostly cited among students across gender, academic year and fields of study. Some students lived with their own families so, they indicated that the food choices were influenced by their parents or their family members who were responsible for cooking.

'As you know, mothers are always worried about your daily meals. My mom is the best of checking what I should eat every day. She cooks for the whole family. Always remember everyone's favorite menus. And she always makes them healthy foods with fruits after

dinner everyday. I live at home with my parents. It helps me a lot not to spend time thinking of and looking for those foods and snacks myself. Just be there and eat what she prepares.’ (one female student)

The following passage gives an example of situational factors (e.g., friends, where to live).

‘I come from Bangkok so I live in campus dorm. There are so many places here in campus where I can find yummy things to eat. I can see that there are both healthy and unhealthy diets especially at the evening market where they sell so many things. I and my friends, we always gather in group and go out to eat there. I think we do not care much about what we eat. We are kind of grown up, making choices of our own. I myself sometimes eat healthy foods, often I don’t’. (one male student)

In some girls, perceived individual own health status and setting of eating were considered as important factors on food choice. Surprisingly, quantity of food was reported from some male students.

‘It is important how you pay the same amount of money but you get more from one food seller than from any others.’ and ‘At my age, I don’t care much about how healthful the food is. It interests me more if it comes in large amount’. (one male student)

For less important factors, they were body image and calorie. A few girls cared about gaining weight and reported that they had to watch their weight and cared of what they eat. Most of students reported less important about calorie. The reason was that it was hard to keep up and calculate calorie in everyday foods and snacks while they had to care more on other things.

Factors influencing students food choices*
<p>Very important</p> <ul style="list-style-type: none"> - Good taste** - Appetite/ food craving** - Cost** - Convenience - Perceived benefits - Appearance of cafeteria, food courts or restaurants <p>Important</p> <ul style="list-style-type: none"> - Situation (e.g., Friends, family)** - Appearance of foods/ foods appeal - Setting (e.g., Home, university, shopping centre) - Individual own health status. - Quantity <p>Less important</p> <ul style="list-style-type: none"> - Body image (weight) - Calorie
<p>**Most important categories (discussed most frequently and with greatest intensity)</p> <p>*Listed in descending order of frequency discussed by students.</p>

Figure 10 Factors Influencing Students' Food Choices

Perceived Meaning of Nutrition Behavior

Most of Thai people know Thailand's nutrition flag diet guideline. So, almost students reported consuming proper diets based on it as the first and most important meaning of nutrition behavior.

Perceived meaning of nutrition behavior*
<p>Consuming proper diets following Thailand's nutrition flag.**</p> <p>Selecting and consuming of diets that promote physical health in long term**</p> <p>Preparing and consuming high fiber diets (vegetables, fruits)**</p> <p>Consuming low fat and low sugar diets.**</p> <p>Consuming freshly cooked/ home made diets.</p> <p>Consuming foods and snacks which are free from toxic agents.</p> <p>Consuming in appropriate amount regarding individual needs.</p>
<p>**Most important categories (discussed most frequently and with greatest intensity)</p> <p>*Listed in descending order of frequency discussed by students.</p>

Figure 11 Students' Perceived Meaning of Nutrition Behavior

When asked about the meaning of nutrition behavior, many of them tended to give examples of behaviors instead of their perceived meaning. Some students reported selecting and consuming of diets that would promote physical health in long term. After probing and discussion, many of them agreed with this meaning.

For foods typically found in students' environments (home, university, grocery stores, food centers, etc.) and how they would give examples of those foods in terms of healthy or unhealthy diets, they reported many examples as shown in figure 12.

Examples of healthy and unhealthy diets
<p>Healthy diets</p> <ul style="list-style-type: none"> - Vegetable and fruit salad** - Fish menus** - Low fat milk and yogurts** - Whole grain bread/ brown rice** - Stir fried vegetables - Vegetable clear soups - Vegetarian diets - Diets with no chemical or any bio hazard contamination <p>Unhealthy diets</p> <ul style="list-style-type: none"> - High fat meats and poultry.** - Sweets.** - Artificially colored or flavored foods.** - Carbonated drinks.** - Instant noodles and soups (high in salt and MSG).** - Unsanitized foods/ raw foods. - Fast foods. - Salty snacks (crispy chips). - Grilled or long deep fried foods (e.g., Barbecue pork, fried chicken). - High trans fat bakeries and pastries - Some kinds of sea foods - Some kinds of preserved fruits and vegetables
**Most important categories (discussed most frequently and with greatest intensity)

Figure 12 Examples of Healthy and Unhealthy Diets

According to students' nutrition behaviors, across gender and academic year, 10 students reported that they had healthy diet behavior, 15 students reported that they tended to have unhealthy diet behavior while 9 students were undecided. The following passage gives an example of undecided dietary behaviors with a reason of being healthy at this age.

'I don't know if my diet behaviors are healthy or unhealthy. I have both of them. I have not thought so much about healthy eating though I know that it is important to my health in long term. So far, I have been healthy with this kind of behavior. If I get older or get sick, I might have to be more careful about what I eat'. (one male student)

4.2.4 Barriers to Healthy Eating

Among these students, many of them found that healthy foods were not convenient to prepare. Every students who reported this were those who lived in campus dormitories where proper cooking area was allowed for very few dorms. Therefore cooking healthy foods was not possible for some.

'It is not quite convenient for me to cook. In my dorm, there are 3 students living in one room and with limited space. Though I want to cook some healthy menus, I have to forget it.' (one female student)

Participants also identified the taste of healthy foods which was not quite delicious when compared to unhealthy foods or snacks.

'I found in "Cheewajit magazine" (one of the most leading health magazines in Thailand) that we should snack on fruits low in sugar, or vegetable with low fat dip and nuts as they are good for health. I tried less sweet fruit and nuts once when I needed snacks. I don't like them. I can not even finish it. And I also don't like brown rice. It looks not so good. It is not soft like white rice and sometimes, it smells weird'. (one male student)

Across gender and fields of study, students reported that one important barrier was being accustomed to buy and consume unhealthy diets.

'I got used to eating potato chips. I love it. Never get bored of it. When I go out to buy things to snack on, I can't help picking these chips and some carbonated drinks or iced green tea in bottles. It is like I don't have to think of any other things but these items to snack on'. (one female student)

One interesting barrier as reported by some students was that they always tended to eat out with friends, following group's decision on what to eat. They discussed about this and agreed that, to some extent, friends could have influence on food choice. When being with friends, some students reported they would think less about what they were eating.

When discussed about suggestions on how to overcome those mentioned barriers, those students who live with their own families suggested that they would try to cook healthy foods in a way that will make them more delicious and more appealing.

'I think we can consider healthy foods and snacks as our favorite menus. Just add a little more creativity in cooking or improving the appearance of the foods. If I want to cook some healthy dishes for my family, I will find some recipe that make them more delicious'. (one female student)

Another interesting discussion on suggestions on how to overcome barriers, many students reported how they should have self-regulations on sticking to nutrition behaviors. Making tangible plans and doing lists including being assertive in what they were determined to do were most discussed.

'It would help me if I make plans, keep my schedule or self-suggestion. I used to do similar things when I wanted to lose weight last year. I wrote it every where in my room, even in my car telling myself not to buy cakes and cookies

and recited to myself to watch what I ate. I think it works. But you have to be really self-determined, too'. (one female student)

To stick on healthy eating behaviors, some students suggested that healthy diets should be made more available such as replacing unhealthy foods and snacks with the healthy ones. Some students also expressed that they would be able to perform nutrition behaviors better if they could find some support from friends and family.

Perceived barriers to healthy eating and suggestions for overcoming barriers.*
<p>Barriers</p> <ul style="list-style-type: none"> - Not convenient to prepare** - Healthy diets do not taste good.** - Being accustomed to buy and to consume unhealthy diets.** - High in price. - Healthy diets are hard to find. - Always tend to eat out with friends (following group's decision). - Not appealing. <p>Suggestions</p> <ul style="list-style-type: none"> - Try to cook healthy foods in a way that will make them more delicious.** - Self regulations (making plans, doing lists, giving reward)** - Make healthy diets available options. - Avoiding situations leading to consuming unhealthy diets. - Finding support from friends and families.
<p>**Most important categories (discussed most frequently and with greatest intensity)</p> <p>*Listed in descending order of frequency discussed by students.</p>

Figure 13 Perceived Barriers to Healthy Eating and Suggestions for Overcoming Barriers

4.2.5 Need for Nutrition Intervention

Nearly half of all students had never attended health intervention or nutrition intervention before. Most of them expressed their opinion about nutrition intervention

as very beneficial for them. Twenty five students reported that they needed nutrition intervention. Four of them said they did not. Five were undecided.

4.2.6 Types of Nutrition Intervention Preferred

Three types of nutrition intervention equally preferred among students were classroom-based nutrition training session, online intervention and printed material for self-study respectively. Five students preferred individual counseling.

Students were familiar most with classroom-based teaching. They preferred this kind of health intervention with brief content. When probing about online intervention, almost every students (32 students) had never experienced online intervention before. Students considered topic of interest, for example; weight management, as the first criteria to attend an online intervention.

'The topic of health intervention should not be in general. It should be specific. Most important, it should be of my interest'. (one female student)

For future online health intervention, duration of an online intervention was also important as it should be short. Some students suggested that appearance of the web site and how to use the web should be as well considered.

4.3 Result of Experimental Design

The result of experimental design will be presented in two parts; changes in fruit and vegetable consumption and other related variables and the mediation analysis.

4.3.1 Changes in Studied Variables

The study is designed as a randomized controlled trial to examine the effects of the intervention in comparison to an active control group. It is expected that the intervention group not only scores higher in intentions, self-efficacy, and planning, but also reports higher levels of fruit and vegetable consumption later on.

The following tables presented means and standard deviations (SD) of All Study variables in both groups, and comparison between groups.

Table 8 Means and Standard Deviations (SD) of Fruit and Vegetable Consumption in Both Groups, and Comparison between Groups

Variable / Group	T1				T2				T3			
	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
FV consumption			.60	.55			2.83	<			2.63	<
Intervention	3.61	2.03			4.80	1.75		.01	4.90	1.56		.01
Active control	3.38	2.04			3.95	1.46			4.18	1.35		

As seen in Table 8 , before the experiment, post-hoc tests revealed that participants in both groups did not differ significantly in their baseline fruit and vegetable consumption, intention for fruit and vegetable consumption, self-efficacy, and planning levels, all $ps > .05$. Significant differences between the two groups for fruit and vegetable consumption were found at posttest and follow-up, $t = 2.83$, $p < .01$ at T2 and $t = 2.63$, $p = .01$ at T3. The intervention group demonstrated a significant increase in fruit and vegetable consumption from baseline to one week after the intervention. The mean fruit and vegetable consumption of the intervention group was 3.61, $SD = 2.03$, at T1, and 4.80, $SD = 1.75$ at T2, $t = -9.20$, $p < .001$, but no significant differences between scores at T2 and T3. The active control group also

showed a significant increase of fruit and vegetable consumption from T1, $M = 3.38$, $SD = 2.04$, to T2, $M = 3.95$, $SD = 1.46$, and $t = -3.74$, $p < .001$, but there was no significant difference between T2 and T3.

Table 9 Means and Standard Deviations (SD) of Intention for Fruit and Vegetable Consumption in Both Groups, and Comparison between Groups

Variable / Group	T1				T2				T3			
	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Intention			-.85	.40			.62	.54			3.36	< .01
Intervention	5.75	1.83			6.68	1.17			6.92	1.18		
Active control	6.02	1.59			6.55	1.12			6.20	1.10		

For the *intention* of fruit and vegetable consumption, the intervention and the active control groups were not significantly different at both baseline and posttest assessments, but significant differences were found at follow-up, $t = 3.36$, $p = .001$. The intervention group showed a significant increase in intention of fruit and vegetable consumption from baseline to one week after the intervention. Intention means of the intervention group were 5.75, $SD = 1.83$, at T1 and 6.68, $SD = 1.17$, at T2, $t = -6.53$, $p < .001$, and there was also a significant difference between T2, 6.68, $SD = 1.17$, and T3, 6.92, $SD = 1.18$, $t = -2.29$, $p < .05$. The active control group also showed a significant difference in intentions from T1, 6.02, $SD = 1.59$, to T2, 6.55, $SD = 1.12$, $t = -4.45$, $p < .001$, but also a significant decrease from T2, 6.55, $SD = 1.12$, to T3, 6.20, $SD = 1.10$, $t = 3.04$, $p < .01$.

Table 10 Means and Standard Deviations (SD) of Planning for Fruit and Vegetable Consumption in Both Groups, and Comparison between Groups

Variable / Group	T1				T2				T3			
	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Planning			.52	.61			3.50	< .01			7.06	< .001
Intervention	3.07	.73			3.42	.55			3.68	.50		
Active control	3.00	.67			3.07	.54			3.08	.40		

For *planning* for fruit and vegetable consumption, significant differences between the intervention and the active control groups were found on posttest and follow-up assessments, $t = 3.50$, $p < .01$ and $t = 7.06$, $p < .001$, respectively. The intervention group indicated a significant increase in planning for fruit and vegetable consumption from baseline to posttest and from posttest to follow-up six weeks after the intervention. Planning means of the intervention group were 3.07, $SD = .73$, at T1 and 3.42, $SD = .55$, at T2, $t = -6.75$, $p < .001$, and $M = 3.68$, $SD = .50$, $t = -5.23$, $p < .001$, at T3. For the active control group there was no significant difference in planning at all time points.

Table 11 Means and Standard Deviations (SD) Self - Efficacy in Both Groups, and Comparison between Groups

Variable / Group	T1				T2				T3			
	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Self-efficacy			1.05	.30			2.73	<			6.31	<
Intervention	3.55	.84			3.89	.59		.01	4.24	.55		.001
Active control	3.39	.78			3.54	.77			3.56	.58		

For *dietary self-efficacy*, differences between the intervention and the active control groups were found at posttest and follow-up assessments, $t = 2.73$, $p < .01$, and $t = 6.31$, $p < .001$, respectively. The intervention group indicated an increase in dietary self-efficacy from baseline to posttest and from posttest to follow-up six weeks after the intervention. Dietary self-efficacy means of the intervention group were 3.55, $SD = .84$, at T1 and 3.89, $SD = .59$, at T2, $t = -4.92$, $p < .001$, and 4.24, $SD = .55$, $t = -4.47$, $p < .001$, at T3. For the active control group there was an increase in dietary self-efficacy from baseline to posttest. Dietary self-efficacy means of the active control group were 3.39, $SD = .78$, at T1 and 3.54, $SD = .77$, at T2, $t = -2.13$, $p < .05$. There was no difference in dietary self-efficacy between T2, 3.54, $SD = .77$, and T3, 3.56, $SD = .58$, $t = -.36$, $p = .72$.

4.3.1.1 Results from Repeated Measures ANOVA

The results from repeated measures ANOVA were to determine whether change took place in the desired behavior.

To examine the intervention effects at posttest and follow-up, repeated measures ANOVA was computed. For the dependent variable *fruit and vegetable consumption*, a main effect for time emerged, $F(2,224) = 51.05, p < .001, \eta^2 = .31$, and an interaction between group and time, $F(2,224) = 4.36, p = .014, \eta^2 = .04$. There was also a main effect of intervention groups, $F(1,112) = 4.09, p = .046, \eta^2 = .04$ (see Figure 14).

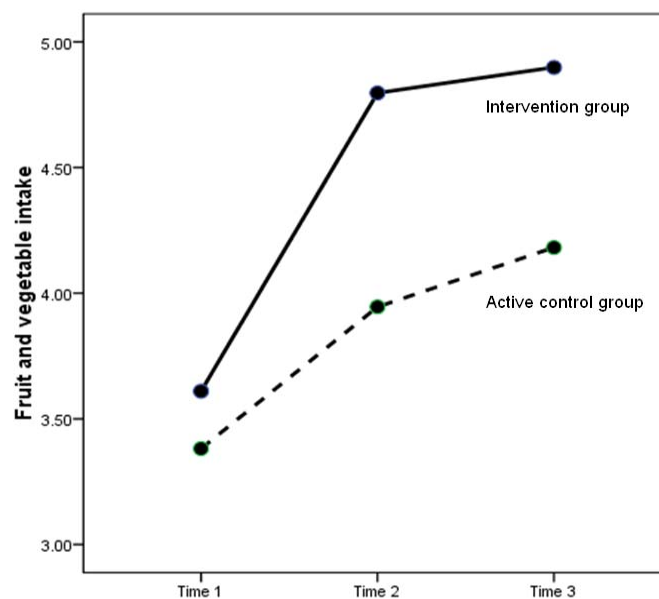


Figure 14 Level of Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time

For the dependent variable *intention*, a main effect for time emerged, $F(2,224) = 32.68$, $p < .001$, $\eta^2 = .23$, and an interaction between group and time, $F(2,224) = 12.18$, $p < .001$, $\eta^2 = .10$. There was no main effect of group, $F(1,112) = .71$, $p = .40$ (see Figure 15).

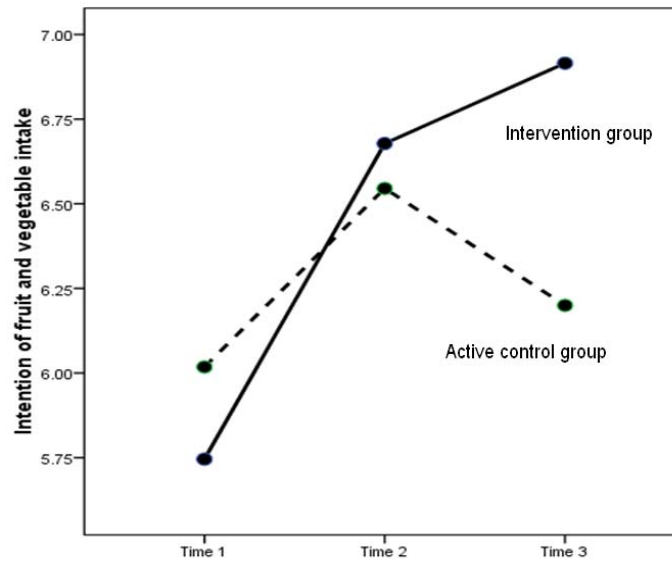


Figure 15 *Level of Intention of Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time*

For the dependent variable *planning*, a main effect for group emerged, $F(1,112) = 12.42, p = .001, \eta^2 = .10$, a main effect for time, $F(2,224) = 35.26, p < .001, \eta^2 = .24$, and an interaction between group and time, $F(2,224) = 20.67, p < .001, \eta^2 = .16$ (see Figure 16).

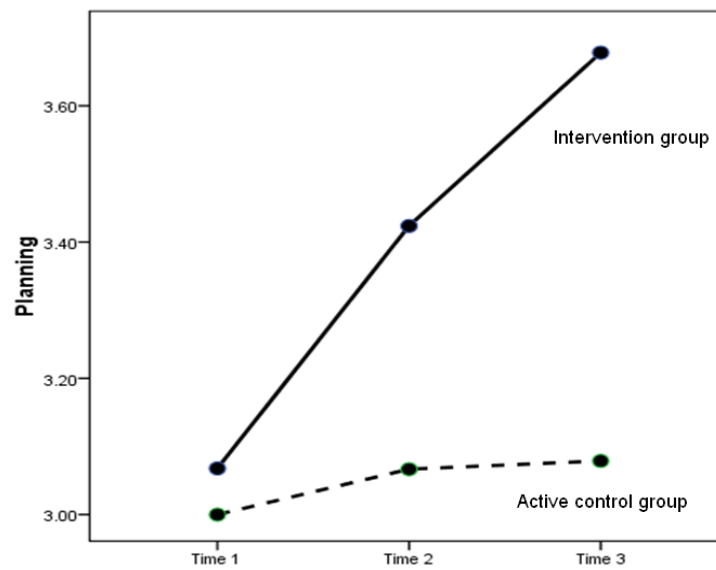


Figure 16 *Level of Planning for Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time*

For the dependent variable *self-efficacy*, a main effect for group emerged, $F(1,112) = 12.49$, $p = .001$, $\eta^2 = .10$, a main effect for time, $F(2,224) = 27.21$, $p < .001$, $\eta^2 = .20$, and an interaction between group and time, $F(2,224) = 9.87$, $p < .001$, $\eta^2 = .08$ (see Figure 17).

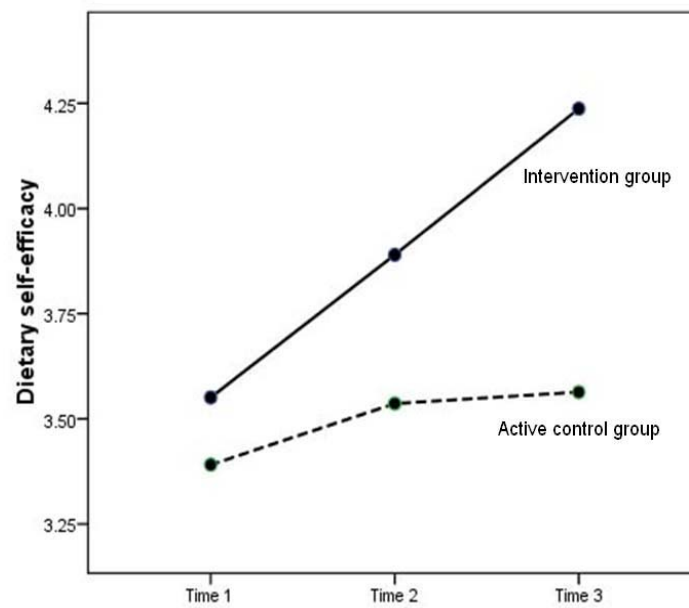


Figure 17 *Level of Perceived Self-Efficacy for Fruit and Vegetable Consumption in the Two Experimental Conditions at Three Points in Time*

4.3.1.2 Mediation Analysis

Figure 18 presented the mediator effects. Multiple mediation was computed using the SPSS macro “Indirect” (Hayes, 2009).

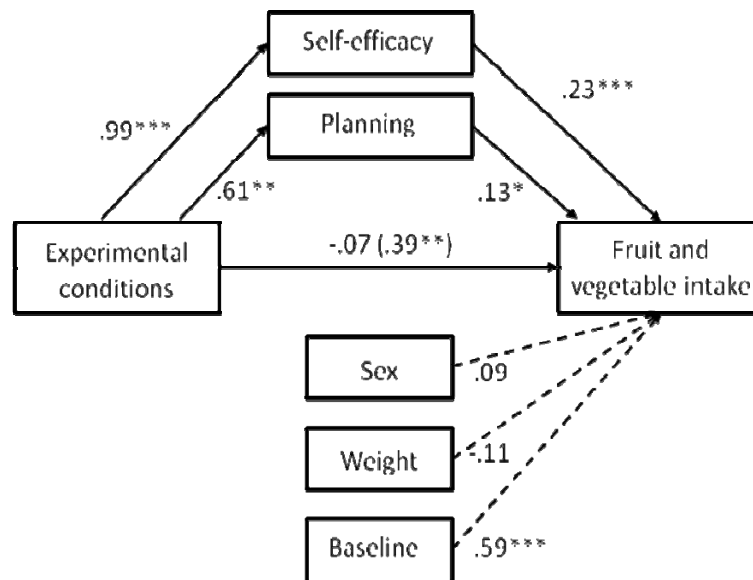


Figure 18 Model with Two Mediators (Self-Efficacy and Planning) and Three Covariates (Sex, Body Weight, and Baseline Dietary Behavior)

The following analysis addresses the question of whether the key intervention ingredients, planning and self-efficacy, were instrumental in the change of fruit and vegetable consumption. For this purpose, the psychometric planning and self-efficacy scales at posttest and follow-up were considered to serve as putative mediators between the interventions and the primary behavioral outcome, fruit and vegetable consumption. Mediation analyses, partly controlling for demographics and baseline behavior, were conducted. The only substantial mediator effects emerged when using changes in coping planning (T3–T2) as well as Time 3 self-efficacy as

mediators, whereas action planning did not mediate. Group membership predicted coping planning, $.61, p < .01$, and self-efficacy, $.99, p < .01$, and subsequently, T3 fruit and vegetable consumption was predicted by these two mediators, coping planning, $.13, p < .05$, and self-efficacy, $.23, p < .01$, controlling for sex, $.09, p > .05$, body weight, $-.11, p > .05$, and baseline fruit and vegetable consumption, $.59, p < .01$. Overall, 63% of the behavior variance was accounted for by the entire model.

Chapter 5

Discussion

The purpose of this study was to explore whether the theory-based nutrition intervention effect changes an increase in health behavior change; fruit and vegetable consumption, among university students in Thailand. The present study also examined whether self-efficacy and planning function as mediators in a mediation model.

Health Action Process Approach (HAPA) was used in this study for the reason that merely intention to change the health behavior was not sufficient. Intention needs to be supplemented by other, more proximal factors that might compromise or facilitate the translation of intentions into action. According to HAPA, postintentional factors have been identified, such as perceived self-efficacy and strategic planning. They help to bridge the intention-behavior gap. While the traditional continuum models have been criticized because of this gap, HAPA is a model that explicitly includes postintentional factors to overcome this gap.

In this chapter, the detail and discussion of all findings were presented in accordance with the following of each objective and hypothesis of the study. Limitations of the study were also provided.

5.1 The Participants of This Study

All participants of this study were university students for the reason that, despite the obvious importance of adopting healthful eating practices, university students tend to engage in a number of problematic eating behaviors, including unhealthy dieting, skipping meals, high intake of fast food and low intake of fruit and vegetable. As previously stated in Chapter 1 and Chapter 2, nutrition education effort was targeted to university students because these young adults are at a crucial stage in their development as they transition from parental control over lifestyle behaviors to assuming responsibility for their own health choices (Cousineau, Franko, Ciccazzo,

Goldstein, & Rosenthal, 2006). Thus, these people in this age group can be regarded as a potential target group for health intervention.

5.2 Discussion of the Results

The results of the current study were discussed in accordance with the following objectives and hypothesis.

5.2.1 Discussion for Objective One

Objective 1: To find out general information about health status, health promoting behaviors, perceptions of health and nutrition behavior and the pattern of nutrition intervention desired among university students.

Discussion for objective 1 will be described in three sections as follows;

5.2.1.1 Discussion for the Finding of Quantitative Design

The finding of the cross-sectional survey indicated that participants reported the moderately high evaluation of their own self-rating of health with and without comparison to others' health status. Participants perform overall health promoting lifestyles in moderate level. The same patterns were found as well for its subscales of physical activities, nutrition, health responsibility and stress management and also for dietary behaviors.

Descriptive results of subscales of health promoting lifestyles of participants showed that participants have performed more often in subscales of interpersonal relations and spiritual growth. However, they have performed most of the health promoting behaviors only for some time (e.g., physical activities, nutrition, health responsibility, and stress management) especially for health responsibility, which is

very important for individuals in aspect of examining themselves in terms of health or danger signs, seeking health information, advices or attending health educational program in order to maintain personal health care.

When looking closely at the nutrition dimension of health promoting lifestyles, they did not routinely engage in limiting use of sugars and food containing sugar (sweets) as well as in sufficient fruit and vegetable consumption as recommended. This finding was consistent with some evidence of Thailand in recent years (MOPH, 1995, 2000a; HISO, 2006; Satheannoppakao, Aekplakorn, & Pradipasen, 2009; Kanungsukkasem et al., 2009) that Thai people, especially adults, consume an inadequate amount of fruit and vegetable. Meanwhile health status of young adults in Thailand is also at risk. Some health-related behaviors underpinning the Thai health transition are associated with increasing obesity (Kantachuvessiri, 2005). This evidence has been supported by a health and lifestyle survey undertaken among 87,134 undergraduate adult students from all regions of Thailand attending an open university (Banwell et al., 2009). Healthy nutrition interventions are required to prevent future obesity gains.

5.2.1.2 Discussion for the Finding of Qualitative Design

Focus group discussions method was used as a qualitative design to explore the perceptions and opinions of university students regarding their health behavior, nutrition behaviors and their need of nutrition intervention in the future. Internal validity was enhanced by semi structured discussions, standardized data collection and analysis procedures aiming to minimize bias. The finding represents the view of a convenience sample of 34 university students. Despite the fact that there was

diversity in terms of gender, fields of study and academic year, all participants were rather homogenous in terms of age.

Most students, across gender and fields of study, were aware of aspects related to health behaviors. Students reported factors perceived as influencing their food choices. Food taste, appetite and cost were expressed as key factors. The findings were consistent with the literature regarding nutrition behavior on fruit and vegetable intake that cost had been viewed as influencing factors for food choices (Kubik, Lytle, & Fulkerson, 2005). Food taste including appetite were influencing factors which have been consistent to the study of Neumark-Sztainer, Story, Perry, and Casey (1999). According to many previous studies, taste seemed to be the most important factor in relation to nutrition behaviors (e.g., fruit and vegetables intake and salt use) (Brug, Debie, Assema, & Weijts, 1995). Factors identified by students as influential to their food choices also included convenience, perceived benefits, and appearance of cafeteria or food court. Other factors discussed included situation (e.g., Eating with friends, family), appearance of foods, setting (e.g., home, university, shopping centre), perceived health status, quantity of food, body image and calorie. As consistent with the studies of Brug et al. (1995) and Neumark-Sztainer et al (1999), findings revealed a view of interrelated factors of socio environmental factors (situation and setting) and personal factors (food taste, appetite, convenience, perceived health status and body image).

When asked what makes it difficult to maintain healthy eating, both male and female students cited similar barriers such as inconvenience, being accustomed to buying unhealthy foods and snacks, and unpleasant taste of healthy food which can be viewed as personal barriers. Interestingly, students reported some of social or situational barriers, e.g., following group's decision. Similar suggestions were given

such as avoiding situations leading to consuming unhealthy diets and seeking social supports indicating that these students were influenced by external factors. The key suggestion being discussed most among participants was that self-regulation should have been enabled aiming to monitor their own behaviors. Some behavioral techniques were introduced such as making plans, things to do lists, and self-rewarding. Participants expressed their need for nutrition intervention. One of their most preferred nutrition interventions was a classroom-based training session. This finding has implications for designing an intervention program tailoring to match the needs of target populations.

The important limitation of this focus group study should be noted. It is that participants were not randomly selected and were not representative of all students which were the main limitation in the use of focus groups. The fact is that they almost always rely on small nonrandom samples and the subjective group discussions. Hence, the results of this study can only be used to identify perception and factors that are probably important in young people's nutrition behaviors.

5.2.1.3 Discussion for the Moderated Mediation Analysis

To study how behavior changes take place, we need to apply mediation analyses, and to study for whom a particular change mechanism is valid, we need to study moderation (MacKinnon & Luecken, 2008). Mediation describes how an effect occurs, that is, how an independent variable affects a dependent variable via a third variable that constitutes the mediator. A mediator might emerge in one group (e.g., high self-efficacious persons), but not in another (e.g., low self-efficacious persons). In such case, self-efficacy operates as a moderator of the mediation relationship (Richert, Reuter, Wiedemann, Lippke, Ziegelmann, & Schwarzer, 2010). In general,

moderation takes place if a variable modifies the form or strength of the relation between an independent and a dependent variable or the mediation role of another variable between the two (MacKinnon, 2008). Moderators, therefore, provide information on when the effects are present.

The result from mediation analysis in the cross sectional data indicated that self-efficacy moderates the planning-behavior relationship. Planning partially mediated the intention-behavior relation, and this mediation was moderated by perceived self-efficacy.

Perceived self-efficacy is a putative moderator for the degree to which planning mediates the intention-behavior relationship. Self-efficacy reflects optimistic self-beliefs when overcoming temptations or adopting a novel course of action. Perceived self-efficacy has been found to be important at all points in health behavior change process (Bandura, 1977) such as dietary behavior (e.g., Mata, Todd, & Lippke, 2010). Self-efficacy is expected to moderate the intention-planning – behavior relation, because people harboring self-doubts might either fail to translate intentions into plans, or they might fail to act upon their plans. For individuals with a high level of self-efficacy, planning might be more likely to facilitate goal achievement because optimistic self-beliefs instigate planning. Also, self efficacious people feel more confident about translating their plans into actual behavior. In other words, whether intentions affect behavior via planning (mediation) might depend on the individual's level of self-efficacy (moderator) (Richert et al., 2010).

The moderated mediation effects in this cross-sectional sample replicate earlier finding in Costa Rican women as well as in South Korean women (Gutierrez-Dona et al., 2009), although the parameters differed as well as the type of interaction. In the South Korean study, intention and self-efficacy interacted in the same way as in

this sample. The moderation type (Intention x Planning) is the same as in South Korea, but different from the one in Costa Rica (Planning x Nutrition).

In the two previous studies in Costa Rica and South Korea, self-efficacy had been operationalized in a behavior-specific manner (nutrition self-efficacy), whereas in this study, general self-efficacy had been measured, not addressing dietary behaviors. The fact that the moderated mediation effect was replicated in spite of this scale incongruence may suggest an overall effect of optimistic self-beliefs on goal pursuit.

However, the cross sectional study has limitation in conclusions about the causal nature of the findings. In addition, young adults' healthy diet consumption may be different from those in other age groups. However, this study used a large sample of university students from different regions. This study provides novel implications for two key influential factors of healthy diet consumption behavior or any other nutrition behaviors. Findings suggest that changes in healthy diet behavior could be influenced by self-efficacy as well as planning. These findings was employed as useful information for designing a nutrition intervention. The findings were significant in that they provide implications for practical behavioral strategies guided by health behavior theory that could be trialled in future health interventions aiming in people in other age groups or in other socio demographic characteristics.

5.2.1.4 Conclusion of Two Studies as Information for Need Assessment for Nutrition Intervention

The result from cross-sectional study indicated that the target group did not routinely engage in health promoting lifestyles in many aspects, e.g., physical activities, stress management, health responsibility, and nutrition. The result indicated

that they did not routinely engage in consuming fruit and vegetable in the amount of daily recommendation. Also, participants rated lowest level in subscale of health responsibility, which is very important for individuals in aspect of examining themselves in terms of health or danger signs, seeking health information and advices or attending health educational program in order to maintain personal health care.

Some useful information was found in the focus group study (e.g., need of nutrition intervention and preferred type of intervention). The results of this study revealed that nutrition intervention was needed among university students and a classroom-based intervention was one of the most preferred types of nutrition intervention. The finding will probably be beneficial in helping nutritionist or health educators aiming to promote nutrition behavior to design their nutrition intervention to match the needs and interests of target groups. A moderated mediation analysis in the cross sectional study also indicated that perceived self-efficacy functioned as a potential moderator for the degree to which planning mediates the intention-behavior relationship. This finding can be applied to facilitate the design of interventions (Schwarzer, Richert, Kreausukon, Remme, Wiedemann, & Reauter, 2010). It is obvious that individuals with very low self-efficacy are at a disadvantage in terms of the adoption of healthy dietary behaviors. People who report low perceived self-efficacy may not benefit from planning intervention. It does not make much sense to merely teach people how to plan there behavior better or how to improve their intention levels. They first need to gain more confidence in their own resources to change or maintain a healthy diet even when barriers prevail (Schwarzer, et al., 2010). This implication, therefore, was used in experimental design in this study. Self-efficacy, then, was included in this nutrition intervention.

5.2.2 Discussion for Objective Two

Objective 2: To determine the changes in university students after receiving theory-based intervention in comparison with the general health education in the following:

- 2.1 Fruit and vegetable consumption
- 2.2 Intention to consume more fruit and vegetable
- 2.3 Planning
- 2.4 Self-efficacy

In this experimental study, one social cognition approach of health behavior change; Health Action Process Approach (HAPA), was utilized as a theoretical background approach for this experimental study because it has been proven to help bridging the intention-behavior gap that can occur in the effort of health behavior change (Sutton, 2008). Changing health-related behaviors requires two separate processes that involve motivation and volition, respectively. First, an intention to change is developed, in part on the basis of self-beliefs. Second, the change must be planned, initiated, and maintained, and relapses must be managed; self - regulation plays a critical role in these processes (Schwarzer, 2008).

In this experimental study, after the short overview of dietary guidelines and some orientation of fruit and vegetable consumption defined in this study, participants received knowledge and activities to promote their self-efficacy and planning. This self-efficacy session was intentionally added as one main part of this intervention. Confidence in personal ability to carry out a behavior influences the direction, intensity and persistence of behavior. Strategies and methods hypothesized to enhance self-efficacy were used; e.g., mastery experiences, verbal persuasion and modeling. Accordingly, participants who have been provided with self-efficacy training should

perceive fewer barriers to their nutrition behavior or be less influenced by them, be more likely to act on their expectation of desirable outcome of being engaged in healthy diet behavior (more fruit and vegetable consumption). Planning session helped them to specify the when, where, and how of the desired behavior and to specify how to cope with anticipated barriers.

Hypothesis 1: Amount of fruit and vegetable consumption of university students in intervention group would increase after intervention.

Repeated measures analysis of variance showed a significant Time x Group interaction. The mean score of fruit and vegetable consumption of the intervention and control group was not different before the intervention. Significant differences between the two groups for fruit and vegetable consumption were found at posttest and follow-up. The result demonstrated the impact of the theory-guided nutrition intervention to increase fruit and vegetable consumption. The intervention group had increase in fruit and vegetable consumption and remained constant from T2 to T3. Compared to the active control group, the significant difference was found between two groups both in posttest and follow-up.

The result from paired t-test also indicated that the intervention group demonstrated a significant increase in fruit and vegetable consumption from baseline to one week after the intervention, but no significant differences between scores at T2 and T3. The active control group also showed a significant increase of fruit and vegetable consumption from to T2, but there was no significant difference between T2 and T3.

After the intervention, there was significant increase for fruit and vegetable consumption in both groups possibly because intervention and active control group both received the same general dietary training in their first session. This session was mainly similar to a traditional and knowledge-based dietary guidelines which were documented from publication by Nutrition Bureau of Ministry of Public Health (MOPH, 2000). Although the active control group did not receive any other behavioral training, this traditional nutrition intervention might possibly provided some knowledge and useful information to this active control group which resulted in the significant increase in fruit and vegetable consumption in T2. However, after six weeks after intervention, the active control group showed no significant increase in fruit and vegetable as well. This can be explained that knowledge given alone without enhancing self-efficacy belief construct and planning intervention can not maintain continuous improvement in desired behavior, since the specific plans create cognitive links between the situation or anticipated opportunities and the goal-related behavior (Gollwitzer, 1999).

Hypothesis 2: The score of intention to consume more fruit and vegetable of university students in intervention group would increase after intervention.

For the *intention* of fruit and vegetable consumption, the intervention and the active control groups were not significantly different at both baseline and posttest assessments, but significant differences were found at follow-up. The intervention group showed a significant increase in intention of fruit and vegetable consumption from baseline to one week after the intervention, and there was also a significant

difference between T2, and T3. The active control group also showed a significant difference in intentions from T1 to T2, but also a significant decrease from T2, to T3.

This finding showed the pattern of changes in intention in three time points quite similar to the previous result of fruit and vegetable consumption. After the intervention, there was significant increase for intention for fruit and vegetable consumption in both groups. However, at six weeks after intervention, the active control group also showed significant decrease in intention. This can be explained that the nutrition training, especially the traditional campaigns widely used now, can have some effects on increasing motivation among participants. Intention to consume more fruit and vegetable can be increased through these traditional campaigns. But, without planning intervention, their intention coupled with health behavior might not persist as long. The desired behavior has not been maintained and tended to be disengaged. Individuals who engage in a combination of action planning and coping planning display greater changes in behavior than individuals who focus on action plans alone (Sniehotta, Scholz, & Schwarzer, 2006).

Hypothesis 3: The score of planning in intervention group would increase after the intervention.

For *planning* for fruit and vegetable consumption, significant differences between the intervention and the active control groups were found on posttest and follow-up assessments. The intervention group indicated significant increase in planning for fruit and vegetable consumption from baseline to posttest and from posttest to follow-up six weeks after the intervention. The increase of mean score of planning in intervention group was caused by the provision of the planning skill

enhancement session in this nutrition intervention. Planning skill training was provided through guided practice, worksheets (nutrition calendar focusing on fruit and vegetable consumption) and modeling. Participants were given an example of planning worksheet filled by two models who were students in the same university and were successfully in nutrition planning. Blank nutrition calendars were provided for using in classroom training and for their own sake. Participants were told to be free to design their own planning sheets and nutrition calendars.

For the active control group there was no significant difference in planning at all time points. It was very likely that the control group showed no significant increase in planning at all time points because the participants in this group received only general dietary information which was merely a knowledge based classroom training lasting for two hours. They received neither other session nor materials. So this could be the reason why they showed some increase for intention or for fruit and vegetable consumption but not for planning.

Hypothesis 4: The score of self-efficacy in intervention group would increase after the intervention.

A similar pattern of results was found for *dietary self-efficacy*, significant differences between the intervention and the active control groups were found at posttest and follow-up assessments. The intervention group indicated significant increase in dietary self-efficacy from baseline to posttest and from posttest to follow-up six weeks after the intervention. Since self-efficacy enhancement has been provided to participants in intervention group as a main part of training session. Participants were arranged to a set of classroom activities (e.g., assignments on

expressing of their own mastery experiences, social persuasion, and a presentation of successful dietary stories of role models who were quite similar to them in terms of status and abilities). It was very likely that participants in this group increased their score of self-efficacy.

For the active control group there was also a significant increase in dietary self-efficacy from baseline to posttest. There was no significant difference in dietary self-efficacy between T2 and T3.

After the intervention at T2 assessment, there was significant increase for dietary self-efficacy in both groups. A possible explanation for the increase in dietary self-efficacy in active control group is that they received general dietary guidelines from a trainer who was a nutritionist and a lecturer from a vocational college. Participants received all knowledge about their dietary practices and fruit and vegetable consumption which include some tips to help them more engaged in fruit and vegetable consumption. This might possibly increase their self-efficacy in posttest assessment. Since the construct measured was dietary self-efficacy. Participants, then, gained some confidence in this specific construct. However, at six weeks after intervention, the active control group showed no significant increase in this construct.

In conclusion, this experimental study examined whether a theory-guided psychological nutrition intervention would make a difference on Thai university students' fruit and vegetable intake. One hundred and fourteen university students were randomly assigned to a psychological intervention or an active control group. The intervention program was based on health behavior theory (Schwarzer, 2008) with a particular focus on perceived self-efficacy and dietary planning skills.

Repeated measures analysis comparing these two groups at pretest, posttest, and follow-up yielded significant time by group interactions for all four dependent

variables: Fruit and vegetable consumption, intentions, planning, and self-efficacy. It was found that participants receiving the intervention consumed significantly more fruit and vegetable than participants in the control condition. This effect remained stable from posttest to follow-up assessment. The same kind of effect emerged for the social-cognitive predictors of dietary behaviors, namely intention, planning, and self-efficacy.

These result demonstrated the impact of the nutrition intervention program to increase fruit and vegetable consumption through a theory-guided methods such as self-efficacy enhancement and planning skill could help the participants to consume more fruit and vegetable. From many studies (Dishman, Motl, Saunders, Felton, Ward, Dowda, & Pate, 2004; Taymoori & Lubans, 2008), it can be clearly explained that providing self-efficacy are identified as mediators in the health promotion intervention.

Self-efficacy plays a predicting and mediating role in relation to individual's achievements, motivation and learning. As a key factor of human agency, self-efficacy mediates between the several determinants of competence (e.g., skill, knowledge, ability or former achievements) and their subsequent performance (Bandura, 2006; Schunk & Pajares, 2001). By combining of methods and components of training courses (e.g., micro teaching, class room videos, lectures, discussions), this was responsible for the efficacy improvement and can be linked to the four sources of efficacy information (Settlage, 2000).

Planning is also a major factor to encourage fruit and vegetable consumption of people in this age group. Planning is regarded as highly valuable in the process of health behavior change (Gollwitzer, 1999; Luszczynska & Schwarzer, 2003;

Sniehotta et al., 2005). Sniehotta et al. (2005) found that planning bridges the gap between behavioral intentions and health behavior.

5.2.3 Discussion for Objective Three

Objective 3: To examine whether self-efficacy and planning function as mediators between intervention condition and fruit and vegetable consumption.

Hypothesis 5: Self-efficacy and planning mediate between intervention condition and fruit and vegetable consumption behavior.

Determining the mechanisms of how, why, and when individuals adopt or abstain from certain behavior requires information regarding mediator variables to provide a clear picture of the process of behavior change. Mediator variables are a third variable that modifies the relationship between two types of variables, that is the independent and dependent variable (Baron & Kenny, 1986). Mediation analysis was used because it provides stronger evidence for causality between predictors and behavior change (Weinstein, 2007).

A further question was whether these variables simply constitute multiple outcomes of the intervention, or whether they might reflect the ingredients of the intervention package and would, thus, operate as causal agents for behavior change. To examine the mechanisms of behavior change, multiple mediation analyses was applied by specifying a theory-guided path model where planning and self-efficacy served as mediators between group membership and later fruit and vegetable consumption. Such an analysis is likely to shed light on the way these variables might have operated in the study (Hayes, 2009; MacKinnon, 2008; Reuter, Ziegelmann,

Wiedemann, & Lippke, 2008). The present findings tend to replicate findings from very different cultures, contributing to their external validity. Similar results confirming the role of self-efficacy and planning have been found in Germany (Richert et al., 2010; Wiedemann et al., 2011; 2011a), Costa Rica (Gutiérrez-Doña et al., 2009), and South Korea (Renner et al., 2008). There are also congruent findings from two randomized trials by Kellar and Abraham (2005) as well as Gratton, Povey, and Clark-Carter (2007) both of which demonstrated an increase in fruit and vegetable consumption in the intervention groups over the control groups. Stadler, Oettingen, and Gollwitzer (2010) compared two brief interventions; one with and one without self-regulation. The group with an added self-regulation training, on top of an information intervention, increased its effectiveness for long-term behavior change whereas participants in the information-only group returned to baseline levels.

Due to the overall experimental findings as well as the mediation analyses, one can conclude that the ingredients of the psychological nutrition intervention have had a favorable impact on subsequent dietary behaviors. It is obvious that self-efficacy in conjunction with planning is able to support sustaining behavior change, which replicates previous findings that such kinds of interventions facilitate changes in health behaviors (Armitage, 2004; Luszczynska et al., 2007; Sniehotta et al., 2005).

5.3 General Discussion

The present study was an attempt to implement a health intervention using quantitative design, qualitative design and experimental design to obtain the result. From literature reviews, quantitative and qualitative designs along with the concept of Intervention Mapping, useful information for designing an intervention were given. The theory-based nutrition intervention program aimed to promote fruit and vegetable

consumption among undergraduate university students in Thailand could make a significant impact on students' fruit and vegetable consumption.

In the moderated mediation model, some insights were found from the previous finding in cross sectional study. The important thing is that moderated mediation elucidates the mechanisms of dietary change. Mediation obviously does not apply to everyone in the same way. There are sub groups of people for whom a putative causal mechanism does not hold true. Self-efficacy was found to be a putative moderator. However, other research has found other relevant moderators, such as sex (Renner et al., 2008), age (Renner et al., 2007), subjective residual life-expectancy (Ziegelmann, Lippke, & Schwarzer, 2006), or intention (Wiedemann et al., 2009).

In this experimental study, the findings turned out to be quite satisfying in intervention group. This might partly be the result of the classroom-based training intervention designed to be implemented among target group. The classroom-based training intervention composed of many methods of delivery and class assignments which could possibly help participants to be more involved with the training session. Additional, the inclusive criteria of participants in this intervention study previously screened only those participants who consumed less fruit and vegetable less than daily recommendation and intended to learn more about nutrition and how to be more engaged in more fruit and vegetable consumption. Thus, in this context, this means that participants were regarded as "intenders". They possibly possessed some motivation to change. In this stage, action planning and recovery self-efficacy are needed and important for goal pursuit and, consequently, act as suitable proximal predictors of health behavior.

In this study, mediation was employed as it quantitatively assesses how interventions induce change in behavior by operating either partially or completely through their impact on intermediate psychological variables. A review of literature from papers published from 1994 to 2006 that described the relationship between psychosocial predictors and fruit and vegetable consumption in adult, the findings indicated that two of five mediation analysis studies that investigated self-efficacy found it to be a significant mediator of fruit and vegetable consumption (change in predictor associated with change in fruit and vegetable consumption β : 0.42-0.60) (Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008). As the most commonly measured construct, self-efficacy for eating more fruits and vegetables (and the related construct, perceived behavioral control) presented the most evidence for association with fruit and vegetable consumption.

It has been shown that the finding of this study is in line with the findings from various cultures and diverse samples. HAPA has been successfully employed as a practical approach for health behavior change. The main addition of the HAPA in comparison to previous models lies in the inclusion of two volitional factors: planning and volitional self-efficacy (Schwarzer, & Luszczynska, 2008). The purpose of these additions was to overcome the black-box nature of the intention-behavior relationship. Such volitional mediators help to elucidate the mechanisms that come into play after people have formed an intention to change their health compromising behaviors. HAPA has yielded the theoretical contribution in the context of health behavior change. The finding of this current study can be replicated in the context of health behaviors. The model appears to be applicable to individual in Asian samples via a training intervention method.

5.4 Conclusion and Recommendations for Application of Research Findings

In conclusion, this study employed quantitative and qualitative designs to obtain information of health behaviors among university students in Thailand. It also included the main part of a randomized controlled trial and the theory-guided intervention design which have elucidated the mechanisms of dietary change processes, using fruit and vegetable consumption in Thailand as an example. The findings replicated similar studies in different populations and, thus, make a contribution to cumulative knowledge on psychological components in dietary changes.

Based on the research findings, to implement the nutrition intervention program on promoting fruit and vegetable consumption among university students, it is recommended that:

1. This program can be applied to be used in health education or health campaigns. In stead of providing only traditional, knowledge-based intervention, behavioral instruments such as self-efficacy and planning should be included. This program can also be applied in curriculum in university. While there are some researchers studying and highlighting the health issue in college such as substance abuse, and risky sexual behaviors which influencing on academic performance. General health education curricula now have been on going in many universities as they strives to meet the general education goal of helping students succeed. To develop sustainable nutrition or health behavior among this group of people, general health education course may need more than providing knowledge

on how important or how to promote health but it should include some behavioral instruments to facilitate them to their goals.

2. For the fact that there are many other health risk factors in Thailand. From a study by the International Health Policy Program in 2004, revealed that alcohol abuse and unsafe sex were the cause of burden of disease among males and unsafe sex and high body mass index were the cause of burden of disease among females. This report also included smoking and non-use of helmet as the leading risk factors among males. Health campaigns widely used in Thailand, especially for safe sex and safe drive, now includes information giving and fear arousal which does not necessarily lead to the adoption of health recommendations. It can cause the defensive avoidance or resistance triggered by messages that cause high levels of fear without providing ways of avoiding the negative outcomes depicted. Health messages should provide receivers with actions that they perceive as feasible and effective. Interventions, therefore, should contain components enhancing self-efficacy in the behavior promoted (Devos-Comby & Salovey, 2002). Fear appeals can facilitate health behavior change only when combined with specific instructions on when, where, and how to perform them (Leventhal, Singer, & Jones, 1965).
3. Although this nutrition intervention yielded satisfactory findings in changing dietary behaviors among university students, it was time consuming, costly and involved a lot of efforts from many people such as expenses for training facilities, documents, food and coffee break provided, research assistant team, health educator or nutritionist as trainers, data collectors, or even students themselves to participate in this

training session. Thus, it would be a challenge and an opportunity for health intervention in higher education institution to consider using interactive health education program (Champion, Springton, Zollinger, Saywell, Monahan, Zhao, & Russell, 2006) or innovative technologies such as computer-based intervention (e.g., Casazza & Cicazzo, 2007) or online intervention that may provide a solution to delivering nutrition education to the audience in university setting. This method of delivering health messages can provide a powerful medium because programs can not only be tailored to the individual, which allows for a more comprehensive approach to behavior change, but the information can be accessed quickly, around the clock, at a low-cost without geographic barriers (Brug, Oenema, & Campbell, 2003; Oenema, Tan, & Brug, 2005).

5.5 Recommendations for Further Research

The results of this study suggest some possible recommendations for further intervention and research as follows;

1. The intervention package included mainly two components, namely self-efficacy and planning. The effects of these two components cannot be disentangled, and one cannot judge whether one of them would have been sufficient to achieve the present results. To identify the specific effects of each of these ingredients, one could design a randomized controlled trial with more groups, providing interventions with one component only. Moreover, positive outcome expectancies (knowledge about nutrition effects on the body) were communicated in the intervention group as well as in the control group, making them less distinct from each other.

2. In the finding of cross sectional study, moderated mediation provides a better understanding of the mechanisms of health behavior change. It does not apply to everyone in the same way. The mediation mechanisms might differ in subgroups of participants (e.g, age, sex). The degree to which planning mediates between intervention conditions and health behaviors may be different in other subgroups of individuals. Future research is needed to extend the mediator models by other moderating factors.
3. The nutrition intervention in this study was a short term program, further research should be a long term study involving the integration of nutrition education curriculum to develop sustainable behaviors.

5.6 Limitations

This study has several limitations that must be acknowledged. Firstly, the present study was conducted in undergraduate students in one university in the north of Thailand. Most participants were from small group of students which may not reflect the nutrition behavior of students in other regions. They might not be representative for a larger population of young adults in this country or beyond. So, the finding can not be generalized to all Thai young adults in this age group. Further, university students who choose to participate in health related focus group discussions and interventions are likely different from students who are not interested to participate in such programs. Therefore, more research is needed to assess whether the results are generalizable to a more diverse group of university students or any other groups.

Secondly, the validity of self-reported behavior of fruit and vegetable consumption should be addressed. Fruit and vegetable consumption in this study was

assessed using a self-reported questionnaire. Limitations inherent to self-report may under- or over-estimate the association by common bias. For example, social desirability bias, particularly relevant in intervention studies after participants have received the intervention, could conflate the association, while, on the other hand, poor validity can attenuate correlations (Cook, & Campbell, 1979). Some other methods should be used to validate the accuracy of the fruit and vegetable consumption record. All assessments were self-reported, and no objective measures were available. Enrichment of self-report behavior by more refined or objective measures would be desirable.

Third, in the experimental study, stages of change were not included. It is possible that most participants were intenders, which means that they were highly motivated to change their diet, which is why they participated in the study in the first place. In this case, the empirical findings apply only to individuals at this stage, but not to others who were non intenders (e.g., contemplators). To account for such moderating effects, one has to assess the stages of change and also look for stage transitions (Wiedemann et al., 2009). Moreover, stage effects would then suggest stage-matched interventions (de Vet, de Nooijer, de Vries, & Brug, 2008).

References

- Abraham, C., & Sheeran, P. (2000). Understanding and changing health behavior: From health beliefs to self-regulation. In P. Norman, C. Abraham & M. Conner (Eds.), *Understanding and changing health behavior* (pp. 3-24). Amsterdam: Harwood Academic Publishers.
- Abraham, C., Sheeran, P. P. N., Conner, M., de Vries, N., & Otten, W. (1999). When good intentions are not enough: Modeling postdecisional cognitive correlates of condom use. *Journal of Applied Social Psychology, 29*, 2591-2612.
- Al-Rethaiaa, A., Fahrny, A. A., & Al-Shwaiyat, N. M. (2010). Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition Journal, 9*, 1-10.
- Ammendolia, C., Cassidy, D., Steensta, I., Soklaridis, S., Boyle, E., Eng, S., Howard, H., Bhupinder, B. & Côté, P. (2009). Designing a workplace return-to-work program for occupational low back pain: an intervention mapping approach. *BMC Musculoskeletal Disorders, 10*, 65 doi:10.1186/1471-2474-10-65
- Ammerman, A. S., Lindquist, C. H., Lohr, K. N., & Hersey, J. (2002). The efficacy of Behavioral interventions to modify dietary fat and fruit and vegetable intake: A review of the evidence. *Preventive Medicine, 35*(1), 25-41.
- Anderson, D. A., Shapiro, J. R., & Lundgren, J. D. (2003). The freshman year of college as a critical period for weight gain: An initial evaluation. *Eating Behaviors, 4*, 363-367.
- Appel, L., Moore, T. J., Obarzaneck, E., Vollner, W. M., Svetkey, L. P., Sacks, F. M., Bray, G. A., Vogt, T. M., Cutler, J. A., Windhauser, M.M., Lin, P., Karanja, N., Simons-Morton, D., McCullough, M., Swain, J., Steele, P., Evans, M. A.,

- Miller, & Harsha, D. W. (1997). A clinical trial of the effects of dietary patterns on blood pressure. *New England Journal of Medicine*, *336*, 117-23.
- Armitage, C. J. (2004). Evidence that implementation intentions reduce dietary fat intake: A randomized trial. *Health Psychology*, *23*, 319-323.
- Armitage, C. J. (2007). Effects of an implementation intention-based intervention on fruit consumption. *Psychology and Health*, *22*, 917-928.
- Armitage, C. J. (2009). Effectiveness of experimenter-provided and self-generated implementation intentions to reduce alcohol consumption in a sample of the general population: A randomized exploratory trial. *Health Psychology*, *28*, 545-553.
- Ascherio, A., Hennekens, C., Willett, W. C., Sacks, F., Roasner, B., Manson, J., Witteman, J, & Stampfer, M. J. (1996). Prospective study of nutritional factors, blood pressure and hypertension among US women. *Hypertension*, *27*, 1065-1072.
- Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin*, *120*, 338 -375.
- Ball, K., MacFarlane, A., Crawford, D., Savige, G., Andrianopoulos, N., & Worsley, A. (2009). Can social cognitive theory constructs explain socio-economic variations in adolescent eating behaviours? A mediation analysis. *Health Education Research*, *24*, 496–506.
- Bandura, A. (1977). Self-efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review*, *84*(2), 191-215.
- Bandura, A. (1986). *Social foundation of thought and action: A social cognitive theory*, New Jersey, Prentice Hall.

- Bandura, A. (1994). *Self-efficacy*. Retrieved from <http://www.des.emory.edu/mfp/BanEncy.html>
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Bandura, A. (2004). Health Promotion by Social Cognitive Means. *Health Education and Behavior, 31*, 143-164.
- Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares, & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 1–43). Greenwich, CT: Information Age Publishing.
- Banwell, C., Lim, L., Suebsman, S., Bain, C., Dixon, J., & Sleight, A. (2009). BMI and health-related behaviors in a national cohort of 87,134 Thai open university students. *Journal of Epidemiology and Community Health*, doi:10.1136/jech.2008.080820
- Baron, R. M., & Kenny, D. A. (1986). The moderator mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.
- Bartholomew, K., Parcel, G., Kok, G., & Gottlieb, N. (2001). *Intervention Mapping: Developing theory and evidence-based health education programs*. Mountain View, CA: Mayfield.
- Bartholomew, L. K., Parcel, G. S., & Kok, G. (1998). Intervention Mapping: A process for designing theory- and evidence-based health education programs. *Health Education and Behavior, 25*, 545-563.
- Bartholomew, L. K., Parcel, G. S., Kok, G., & Gottlieb, N. (2006). *Planning health promotion programs: An Intervention Mapping approach*. San Francisco, C.A.: Jossey-Bass.

- Bazzano, L. A. (2006). The High Cost of Not Consuming Fruits and Vegetables. *Journal of the American Dietetic Association, 106*(9), 1364-1368.
- Beerman, K. A. (1991). Variation in nutrient intake of college students: a comparison by students' residence. *Journal of American Dietetic Association, 91*, 343-4.
- Betts, N. M., Amos, R. J., Keim, K., Peters P. K., & Stewart B. (1997). Ways young adults view foods. *Journal of Nutrition Education, 29*, 73-79.
- Brown, L. B., Dresen, R. K., & Eggett, D. L. (2005). College students can benefit by participating in a prepaid meal plan. *Journal of the American Dietetic Association, 105*, 445-448.
- Brug, J., Debie, S., van Assema, P., & Weijts, W. (1995). Psychosocial determinants of fruit and vegetable consumption among adults: results of focus group interviews. *Food Quality and Preference, 6*, 99-107.
- Brug, J., Lechner, L., & De Vries, H. (1995). Psychosocial determinants of fruit and vegetable Consumption. *Appetite, 25*, 285-296.
- Brug, J., Oenema, A., & Campbell, M. (2003). Past, present, and future of computer tailored nutrition education. *American Journal of Clinical Nutrition, 77*(4 Supplement), 1028S-1034S.
- Campbell, M. K., Carr, C., DeVellis, B., Switzer, B., Biddle, A., Amamoo, A., Walsh, J., Zhou, B., & Sandler, R. (2009). A randomized trial of tailoring and motivational interviewing to promote fruit and vegetable consumption for cancer prevention and control. *Annals of Behavioral Medicine, 38*, 71-85.
- Campbell, M. K., Carr, C., DeVellis, B., Switzer, B., Biddle, A., Amamoo, A., Walsh, J., Chou, B., & Sandler, R. (2009). A Randomized Trial of Tailoring and Motivational Interviewing to Promote Fruit and Vegetable Consumption for Cancer Prevention and Control. *Annals of Behavioral Medicine, 38*, 71-85.

- Carey, M. (1994). The group effect in focus groups: planning, implementing, and interpreting focus group research. In Morse J., Ed. *Critical Issues in Qualitative Research Methods*, Sage Publications; 1994. 225–241.
- Casazza, K., & Cicazzo, M. (2007). The method of delivery of nutrition and physical activity information may play a role in eliciting behavior changes in adolescents. *Eating Behaviors*, 8, 73–82.
- Champion, V. L., Springton, J. K., Zollinger, T. W., Saywell, R. M., Monahan, P. O., Zhao, Q., & Russell, K. M. (2006). Comparison of three interventions to increase mammography screening in low income African American women. *Cancer Detection and Prevention*, 30, 535–544.
- Chung, S. J., & Hoerr, S. L. (2005). Predictors of fruit and vegetable intakes in young adults by gender. *Nutrition Research*, 25, 453-463.
- Chung, S. J., Hoerr, S., Levine, R., & Coleman, G. (2006). Process underlying young women's decisions to eat fruits and vegetables. *Journal of Human Nutrition and Dietetics*, 19, 287-298.
- Contento, I. R., Randell, J. S., & Basch, C. E. (2002). Review and analysis of evaluation measures used in nutrition education intervention research. *Journal of Nutrition Education and Behavior*, 34(1), 2-25.
- Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: design & analysis issues for field settings*. Chicago: Rand McNally.
- Corbie-Smith, G., Adimora, A. A., Youmans, S., Muhammad, M., Blumenthal, C., Ellison, A., et al. (2010). Project GRACE: A Staged Approach to Development of a Community-Academic Partnership to Address HIV in Rural African American Communities. *Health Promotion Practice*, Published online before print August 4, 2010, doi: 10.1177/1524839909348766

- Cousineau, T. M., Franko, D. L., Ciccazzo, M., Goldstein, M., & Rosenthal, E. (2006). Web – based nutrition education for college students: Is it feasible? *Evaluation and Program Planning, 29*, 23-33.
- Cousineau, T. M., Franko, D. L., Ciccazzo, M., Goldstein, M., & Rosenthal, E. (2006). Web-based nutrition education for college students: Is it feasible? *Evaluation and Program Planning, 29*, 23-33.
- Crawford, D., Ball, K., Mishra, G., Salmon, J., & Timperio, A. (2006). Which food – related behaviours are associated with healthier intakes of fruits and vegetables among women? *Public Health Nutrition, 10*(3), 256-265.
- Crujeiras, A. B., Goyenechea, E., & Martinez, J. A. (2010). Fruit, vegetables, and legumes consumption: Role in preventing and treating obesity. *Bioactive Foods in Promoting Health: Fruits and Vegetables*, Elsevier.
- Crujeiras, A. B., Parra, M. D., Rodriguez, M. C., Martinez de Morentin, B. E., & Martinez, J. A. (2006). A role for fruit content in energy-restricted diets in improving antioxidant status in obese women during weight loss. *Nutrition, 22*, 593–599.
- Cullen, K. W., Bartholomew, L. K., Parcel, G. S., & Kok, G. (1998). Intervention Mapping: Use of theory and data in the development of a fruit and vegetable nutrition program for girl scouts. *Journal of Nutrition Education, 30*, 188-195.
- de Vet, E., de Nooijer, J., de Vries, N. K., & Brug, J. (2008). Testing the transtheoretical model for fruit intake: comparing web-based tailored stage-matched and stage-mismatched feedback. *Health Education Research, 23*(2), 218–227.

- DeBate, R. D., Topping, M., & Sargent, R. G. (2001). Racial and gender differences in weight status and dietary practices among college students. *Adolescence*, 36, 819-833.
- Detaille, S. I., van der Gulden, J. W., Engels, J. A., Heerkens, Y. F., & van Dijk, F. J. (2010). Using intervention mapping (IM) to develop a self-management programme for employees with a chronic disease in the Netherlands. *BMC Public Health*, 10, 353.
- Devos – Comby, L., & Salovey, P. (2002). Applying Persuasion Strategies to Alter HIV-Relevant Thoughts and Behavior. *Review of General Psychology*, 6(3), 287–304.
- Diefendorf, J. M., & Lord, R. G. (2003). The volitional and strategic effects of planning on task performance and goal commitment. *Human Performance*, 16, 365-387.
- Dinger, M. K., & Waigandt, A. (1997). Dietary intake and physical activity behaviors of male and female college students. *American Journal of Health Promotion*, 11(5), 360-362.
- Dishman, R. K., Motl, R. W., Saunders, R., Felton, G., Ward, D. S., Dowda, M., & Pate, R. R. (2004). Self – efficacy partially mediates the effect of a school – based physical activity intervention among adolescent girls. *Preventive Medicine*, 38, 628-636.
- Douglas, K., & Collins, J. (1997). Results from the national college health risk behavior survey. *Journal of American College Health*, 46, 55-67.
- FAO/WHO. (2004). Fruit and vegetable for health: *Report of a Joint FAO/WHO workshop*, 1-3 September, 2004, Kobe, Japan.

- Farquhar, S. A., Parker, E. A., Schulz, A. J., & Israel, B. A. (2006). Application of qualitative methods in program planning for health promotion interventions. *Health Promotion Practice, 7*(2), 234-42.
- Franko, D. L., Cousineau, T. M., Trant, M., Green, T. C., Rancourt, D., Thompson, D., & Ciccazzo, M. (2008). Motivation, self-efficacy, physical activity and nutrition in college students: Randomized controlled trial of an internet-based education program. *Preventive Medicine, 47*, 369–377.
- Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion, 11*, 87-97.
- Gollwitzer, P. M. (1996). The volitional benefits of planning, in P.M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 287-312). New York: Guilford.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*, 493-503.
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta – analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 249-268.
- Gollwitzer, P. M., & sheeran, P. (2006). Implementation intentions and goal achievement: A meta – analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69-119.
- Gratton, L., Povey, R., & Clark-Carter, D. (2007). Promoting children’s fruit and vegetable consumption: Interventions using the Theory of Planned Behaviour as a framework. *British Journal of Health Psychology, 12*, 639-650.

- Green, L. W., & Kreuter, M. W. (2005). *Health Program Planning: An Educational and Ecological Approach*. 4th ed. NY: McGraw-Hill Higher Education.
- Guenther, P. M., Dodd, K. W., Reedy, J., & Krebs-Smith, S. M. (2006). Most Americans eat much less than recommended amounts of fruits and vegetables. *Journal of the American Dietetic Association, 106*, 1371-1379.
- Gutiérrez-Doña, B., Lippke, S., Renner, B., Kwon, S., & Schwarzer, R. (2009). How self-efficacy and planning predict dietary behaviors in Costa Rican and South Korean women: A moderated mediation analysis. *Applied Psychology: Health & Well-Being, 1*, 91–104. DOI: 10.1111/j.1758-0854.2009.01004.x
- Hall, J. N., Moore, S., Harper, S. B., Lynch, J. W. (2009). Global variability in fruit and vegetable consumption. *American Journal of Preventive Medicine, 36*, 402–9.
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*, 408-420. doi: 10.1080/03637750903310360
- Heackhausen, H., & Gollwitzer, P. M. (1987). Thought content and cognitive functioning in motivational vs. volitional states of mind. *Motivation and Emotion, 11*, 101-120.
- Health Information System Development Office (HISO). (2006). *[Health status report of Thailand]* (in Thai). Nonthaburi, Thailand: Thai Health Promotion Foundation.
- Heckhausen, H. (1991). *Motivation and Action*. Berlin: Springer – Verlag.
- Hertzler, A. A., & Frary, R. (1992). Dietary status and eating out practices of college students. *Journal of American Dietetic Association, 92*, 867-9.

- Hou, S., Fernandez, M. E., & Parcel, G. S. (2004). Development of a Cervical Cancer Educational Program for Chinese Women Using Intervention Mapping. *Health Promotion Practice, 5*(1), 80-87.
- Hou, S., Fernandez, M., Baumler, E., & Parcel, G. (2002). Effectiveness of an intervention to increase Pap test screening among Chinese women in Taiwan. *Journal of Community Health, 27*(4), 277- 290.
- Huang, T. T., Harris, K. J., Lee, R. E., Nazir, N., Born, W., & Kaur, H. (2003). Assessing Overweight, Obesity, Diet, and Physical Activity in College Students. *Journal of American College Health, 52*(2), 83-86.
- Huang, Y., Song, W. O., Schemmel, R. A., & Hoerr, S. M. (1994). What do college students eat? Food selection and meal pattern. *Nutrition Research, 8*, 1143-1153.
- Jepson, R. G., Harris, F. M., Platt, S., & Tannahill, C. (2010). The Effectiveness of Interventions to Change Six Health Behaviours: A Review of Reviews. *BMC Public Health, 10*, 564.
- Joshiqura, K. J., Hu, F. B., Manson, J. E., Stampfer, M. J., Rimm, E. B., Speizer, F. E., Colditz, G., Ascherio, A., Rosner, B., Spiegelman, D., & Willett, W. C. (2001). The effect of fruit and vegetable intake on risk for coronary heart disease. *Annals of Internal Medicine, 134*, 1106-14.
- Kantachuvessiri, A. (2005). Obesity in Thailand. *Journal of the Medical Association of Thailand, 88*(4), 554-562
- Kanungsukkasem, U., Ng, N., Van Minh, H., Razzague, A., Ashraf, A., Juvekar, S., Ahmed, S. M., & Bich, T. H. (2009). Fruit and vegetable consumption in rural adults population in INDEPTH HDSS sites in Asia. *Global Health Action, 28*, 35-43.

- Kasperek, D. G., Corwin, S. J., Valois, R. F., Sargent, R. G., & Morris, R. L. (2008). Selected health behaviors that influence college freshman weight change. *Journal of American College Health, 56*, 437-444.
- Keim, K. S., Stewart, B., & Voichick, J. (1997). Vegetable and Fruit Intake and Perceptions of Selected Young Adults. *Journal of Nutrition Education, 29*(2), 80-85.
- Keller, I., & Abraham, C. (2005). Randomized controlled trial of a brief research – based intervention promoting fruit and vegetable consumption. *British Journal of Health Psychology, 10*, 543-558.
- Kok, G., Schaalma, H., Ruiter, R. A. C., Brug, J., & Van Empelen, P. (2004). Intervention mapping: A protocol for applying health psychology theory to prevention programmes. *Journal of Health Psychology, 9*, 85–98.
- Kok, G., Van den Borne, B., & Mullen, P.D. (1997). Effectiveness of health education and health promotion: meta-analyses of effect studies and determinants of effectiveness. *Patient Education and Counseling, 30*, 19-27.
- Kosulwat, V. (2002). The nutrition and health transition in Thailand. *Public Health Nutrition, 5*, 183-9.
- Krueger, R. (1994). *Focus Groups: A Practical Guide for Applied Research*, 2nd ed. Sage Publications, Thousand Oaks.
- Kubik, M. Y., Lytle, L., & Fulkerson, J. A. (2005). Fruits, vegetables, and football: Findings from focus groups with alternative high school students regarding eating and physical activity. *Journal of Adolescent Health, 36*, 494–500.
- Kuhl, J. (1985). Volitional mediator of cognitive-behavior consistency: Self – regulatory processes and action versus state orientation. In J. Kuhl, & J.

- Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 101-128). New York: Springer-Verlag.
- Lampe, J. W. (1999). Health effects of vegetables and fruit: Assessing mechanisms of action in human experimental studies. *American Journal of Clinical Nutrition*, 70, 475S–490S.
- Larson, N. I., Neumark - Sztainer, D. R., Harnack, L. J., Wall, M. M., Story, M. T., & Eisenberg, M. E. (2008). Fruit and Vegetable Intake Correlates During the Transition to Young Adulthood. *American Journal of Preventive Medicine*, 35(1), 33–37.
- Leventhal, H., Singer, R., & Jones, S. (1965). Effects of fear and specificity of recommendation upon attitudes and behavior. *Journal of Personality and Social Psychology*, 2, 20–29.
- Li Hui., W., Hsin Ling, Y., Yin Chang, C., Davis, R., Schwartz, M. E., & Tam, C. F. (2008). A health probe in college students living in Los Angeles and in Taiwan: Dietary pattern, physical activity and energy balance. *College Student Journal*, 42, 756-770.
- Lippke, S., Wiedemann, A. U., Ziegelmann, J. P., Reuter, T., & Schwarzer, R. (2009). Self-efficacy Moderates the Mediation of Intentions Into Behavior via Plans. *American Journal of Health Behavior*, 33(5), 521-529.
- Lippke, S., Ziegelmann, J. P., & Schwarzer, R. (2004). Behavioral intentions and action plans promote physical exercise: A longitudinal study with orthopedic rehabilitation patients. *Journal of Sport & Exercise Psychology*, 26, 470–483.
- Liu, S., Manson, J. E., Lee, I. M., Cole, S. R., Hennekens, C. H., Willett, W. C. & Buring, J. E. (2000). Fruit and vegetable intake and risk of cardiovascular

- disease: The women's health study. *American Journal of Clinical Nutrition*, 72, 922-928.
- Lock, K., Pomerleau, J., Causer, L., Altmann, D. R., McKee, M. (2005). The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet. *Bulletin of the World Health Organ*, 83, 100 - 108.
- Lowry, R., Galuska, D. A., Fulton, J. E., Wechsler, H., Kann, L., & Collings, J. L. (2000). Physical activity, food choice, and weight management goals and practices among US college students. *American Journal of preventive Medicine*, 18, 18-27.
- Luszczynska, A., & Schwarzer, R. (2003). Planning and self-efficacy in the adoption and maintenance of breast self-examination: A longitudinal study on self regulatory cognitions. *Psychology & Health*, 18, 93-108.
- Luszczynska, A., & Sutton, S. (2006). Physical activity after cardiac rehabilitation: Evidence that different types of self-efficacy are important in maintainers and relapsers. *Rehabilitation Psychology*, 51(4), 314–321.
- Luszczynska, A., Mazurkiewicz, M., Ziegelmann, J.P., & Schwarzer, R. (2007). Recovery self-efficacy and intention as predictors of running: A cross-lagged panel analysis over a two-year period. *Psychology of Sport and Exercise*, 8, 247–260.
- Luszczynska, A., Tryburcy, M., & Schwarzer, R. (2007). Improving fruit and vegetable consumption: A self-efficacy intervention compared to a combined self-efficacy and planning intervention. *Health Education Research*, 22, 630–638.

- MacKinnon, D. P. (2008). *Introduction to Statistical Mediation Analysis*. New York, LEA.
- MacKinnon, D. P., & Luecken, L. J. (2008). How and for whom? Mediation and moderation in health psychology. *Health Psychology. Supplementary Issue: Mediation and Moderation*, 27, 99–100.
- Marlatt, G. A. (2002). *Harm reduction: Pragmatic strategies for managing high-risk behaviors*. New York: Guilford.
- Marlatt, G. A., Baer, J. S., & Quigley, L. A. (1995). Self-efficacy and addictive behavior. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 289–315). New York: Cambridge University Press.
- Martinelli, A. M. (1999) An explanatory model of variables influencing health promotion behaviors in smoking and nonsmoking college students. *Public Health Nursing* 16(4), 263–269.
- Mata, J., Todd, P. M., & Lippke, S. (2010). When diets last: lower rule complexity increases diet adherence. *Appetite*, 54(1), 37–43.
- Matvienko, O., Lewis, D. S., & Schafer, E. (2001). A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition and Behavior*, 33, 95-101.
- McEachan, R., Lawton, R. J., Jackson, C., Conner, M, & Lunt, J. (2008). Evidence, Theory and Context: Using intervention mapping to develop a worksite physical activity intervention. *BMC Public Health*, 8, 326 doi:10.1186/1471-2458-8-326
- Meyerowitz, B. E., Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of personality and social psychology*, 52, 500-510.

- Michie, S. (2008). From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology: An International Review*, 57(4), 660–680.
- Ministry of Public Health (MOPH), (2004). *DALY's from risk factors among Thai people, 1999 and 2004*. Retrieved from http://www.moph.go.th/ops/thp/index.php?option=com_content&task=view&id=6&Itemid=2
- Ministry of Public Health (MOPH). (1995). *The Fourth National Nutrition Survey of Thailand*. Nonthaburi: Department of Health, Ministry of Public Health, Thailand.
- Ministry of Public Health (MOPH). (2000a). *[Health behaviors and physical activity practices among employees within the Ministry of Public Health]* (in Thai). Nonthaburi, Thailand: Physical Activity Division, Ministry of Public Health.
- Ministry of Public Health (MOPH). (2000b). *[Nutrition flag manual]* (in Thai). Nonthaburi, Thailand: Department of Health, Ministry of Public Health.
- Mkumbo, K., Schaalma, H., Kaaya, S., Leerlooijer, J., Mbwambo, J., & Kilonzo, G. (2009). The application of intervention Mapping in developing and implementing school-based sexuality and HIV/AIDS education in a developing country context: The case of Tanzania. *Scandinavian Journal of Public Health*, 37, 28.
- Moore, T. J., Vollmer, W. M., Appel, L. J., Sacks, F. M., Svetkey, L. P., Vogt, T. M., Conlin, P. R., Simons-Morton, D. G., Carter-Edwards, L., & Harsha, D. W. (1999). Effect of dietary patterns on ambulatory blood pressure: results from the Dietary Approaches to Stop Hypertension (DASH) Trial. DASH Collaborative Research Group. *Hypertension*, 3, 472-477.

- Nandi, B. K., & Bhattacharjee, L. (2005). Why fruits and vegetables? Their contribution to improving nutrition in developing countries. *Paper presented at the FAO Sub Regional Workshop on Quality and Safety of Fresh Fruits and Vegetables*, 28 February to 4 March 2005.
- Nelson, M. C. (2008). Addressing Nutrition and Physical Activity Promotion on the College Campus. *Spectrum*, June, 24-28.
- Nelson, M. C. (2008). Addressing Nutrition and Physical Activity Promotion on the College Campus. *Spectrum*. Cambridge, MA: Aetna Student Health.
- Neumark-Sztainer, D., Story, M., Perry, C., & Casey, M. A. (1999). Factors Influencing food choices of adolescents: findings from focus-group discussions with adolescents. *Journal of American Dietetic Association*, 99, 929–937.
- Neumark-Sztainer, D., Wall, M., Perry, C., & Story, M. (2003). Correlates of fruit and vegetable intake among adolescents Findings from Project EAT. *Preventive Medicine*, 37, 198–208.
- Norman, P., & Conner, M. (2005). The Theory of Planned Behavior and exercise: Evidence for the mediating and moderating roles of planning on intention-behavior relationships. *Journal of Sport and Exercise Psychology*, 27, 488–504.
- Norman, P., Abraham, C. J., & Connor, M. (2000). *Understanding and changing health behaviour: From health beliefs to self-regulation*. Amsterdam: Harwood Academic Publishers.
- O’Dea, J. A., & Abraham, S. (2002). Eating and exercise disorders in young college men. *Journal of American College Health*, 50(6), 273 – 279.

- Oenema, A., Tan, F., & Brug, J. (2005). Short-term efficacy of web-based computer-tailored nutrition intervention: Main effects and mediators. *Annals of Behavioral Medicine, 29*(1), 54–63.
- Pajk, T., Rezar, V., Levart, A., & Salobir, J. (2006). Efficiency of apples, strawberries, and tomatoes for reduction of oxidative stress in pigs as a model for humans. *Nutrition, 22*, 376–384.
- Pearman, S. N., III, & Valois, R. F. (1997). The impact of a required college health and physical education course on the health status of alumni. *Journal of American College Health, 46*(2), 77-85.
- Pender, N. J., Murdaugh, C. L., & Parsons, M. A. (2002). *Health Promotion in Nursing Practice* (4th ed.). USA: Prentice Hall.
- Perez-Rodrigo, C., Wind, M., Hildonen, C., Bjelland, M., Aranceta, J., Klepp, K. I., & Brug, J. (2005). The pro children intervention: applying the intervention mapping protocol to develop a school-based fruit and vegetable promotion programme. *Annals of Nutrition and Metabolism, 49*(4), 267-277.
- Perloff, L. S., & Fetzer, B. K. (1986). Self-other judgments and perceived vulnerability to victimization. *Journal of Personality & Social Psychology, 50*(3), 502-510.
- Pham, L. B., & Taylor, S. E. (1999). The Effect of Mental Simulation on Goal-Directed Performance. *Imagination, Cognition and Personality, 18*, 253-268.
- Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42*, 185–227.

- Promdee, L., Trakulthong, J., & Kangwantrakul, W. (2007). Sucrose consumption in Thai undergraduate students. *Asia Pacific Journal of Clinical Nutrition, 16* (suppl 1), 22-26.
- Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2008). Changes in weight and health behaviors from freshman through senior year of college. *Journal of Nutrition Education and Behavior, 40*, 39-42.
- Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2010). Weight changes, Exercise, and Dietary Patterns During Freshman and Sophomore Years of College. *Journal of American College Health, 53*(6), 245-251.
- Renner, B., & Schwarzer, R. (2003). Social-cognitive factors in health behavior change. In J. Suls & K. A. Wallston (Eds.), *Social psychological foundations of health and illness Blackwell series in health psychology and behavioral medicine* (pp. 169-196). Malden, MA: Blackwell Publishers.
- Renner, B., Hahn, A., & Schwarzer, R. (1996). *Risiko und Gesundheitsverhalten. Dokumentation der Messinstrumente des Forschungsprojekts "Berlin Risk Appraisal and Health Motivation Study" (BRAHMS)*. Berlin: Freie Universitat Berlin. 1996.
- Renner, B., Kwon, S., Yang, B.-H., Paik, K-C., Kim, S. H., Roh, S., & Schwarzer, R. (2008). Social-cognitive predictors of dietary behaviors in South Korean men and women. *International Journal of Behavioral Medicine, 15*, 4-13.
- Renner, B., Spivak, Y., Kwon, S., & Schwarzer, R. (2007). Does age make a difference? Predicting physical activity of South Koreans. *Psychology and Aging, 22*, 482-493.

- Reuter, T., Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2009). Long-term relations between intentions, planning and exercise: A 3-year longitudinal study in orthopedic rehabilitation. *Rehabilitation Psychology, 54*, 363-371.
- Reuter, T., Ziegelmann, J. P., Wiedemann, A. U., & Lippke, S. (2008). Dietary planning as a mediator of the intention-behavior relation: An experimental-causal-chain design. *Applied Psychology: An International Review. Special Issue: Health and Well-Being, 57*, 194-207.
- Richards, A., Kattelman, K. K., & Ren, C. (2006). Motivating 18- to 24-year-olds to increase their fruit and vegetable consumption. *Journal of American Dietetic Association, 106*, 1405-1411.
- Richert, J., Reuter, T., Wiedemann, A. U., Lippke, S., Ziegelmann, J., & Schwarzer, R. (2010). Differential effects of planning and self-efficacy on fruit and vegetable consumption. *Appetite, 54*, 611-614.
- Rodgers, W. M., Hall, C. R., Blanchard, C. M., McAuley, E., & Munroe, K. J. (2002). Task and scheduling self-efficacy as predictors of exercise behavior. *Psychology and Health, 27*, 405-416.
- Rodgers, W., & Sullivan, M. J. L. (2001). Task, coping and scheduling self-efficacy in relation to frequency of physical activity. *Journal of Applied Social Psychology, 31*, 741-753.
- Rodgers, W. M., Wilson, P. M., Hall, C. R., Fraser, S. N., & Murray, T. C. (2008). Evidence for a Multidimensional Self-Efficacy for Exercise Scale. *Research Quarterly for Exercise and Sport, 79*(2), 1-13.
- Satheanopkiao, W., Aekplakorn, W., & Pradipasen, M. (2009). Fruit and vegetable consumption and its recommended intake associated with sociodemographic

- factors: Thailand National Health Examination Survey III. *Public Health Nutrition*, 12(11), 2192-8.
- Scholz, U., Nagy, G., Göhner, W., Luszczynska, A., & Kliegel, M. (2009). Changes in self-regulatory cognitions as predictors of changes in smoking and nutrition behaviour. *Psychology & Health*, 24, 545-561.
- Scholz, U., Schüz, B., Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2008). Beyond behavioural intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology*, 13, 479-494.
- Scholz, U., Sniehotta, F. F., & Schwarzer, R. (2005). Predicting physical exercise in cardiac rehabilitation: The role of phase-specific self-efficacy beliefs. *Journal of Sport and Exercise Psychology*, 27, 135–151.
- Schunk, D. H. (1989). Self-efficacy and achievement behaviors. *Educational Psychology Review*, 1, 173–208.
- Schunk, D. H., & Pajares, F. (2001). The development of academic self-efficacy. In A. Wigfield, & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 15–32). San Diego, CA: Academic Press.
- Schunk, D.H. (1987). Peer models and children's behavioral change. *Review of Educational Research*, 57, 149–174.
- Schüz, B., Sniehotta, F. F., Wiedemann, A., & Seemann, R. (2006). Adherence to a daily flossing regimen in university students: effects of planning when, where, how and what to do in the face of barriers. *Journal of Clinical Periodontology*, 33(9), 612-619.
- Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.),

- Self-efficacy: Thought control of action* (pp. 217-243). Washington, DC: Hemisphere.
- Schwarzer, R. (2001). Social-cognitive factors in changing health related behavior. *Current Directions in Psychological Science, 10*, 47-51.
- Schwarzer, R. (2008). Modeling Health Behavior Change: How to Predict and Modify the Adoption and Maintenance of Health Behaviors. *Applied Psychology, 57*(1), 1-29.
- Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In Weinman J., Wright S., Johnston M., eds. *Measures in health psychology: A user's portfolio. Causal and control beliefs*. Windsor, England: NFER-NELSON. 1995; 35-39.
- Schwarzer, R., & Luszczynska, A. (2008). How to Overcome Health-Compromising Behaviors: The Health Action Process Approach. *European Psychologist, 13*(2), 141-151.
- Schwarzer, R., & Renner, B. (2000). Social-cognitive predictors of health behavior: Action self-efficacy and coping self-efficacy. *Health Psychology, 19*, 487-495.
- Schwarzer, R., Luszczynska, A., Ziegelmann, J. P., Scholz, U., & Lippke, S. (2008). Social cognitive predictors of physical exercise adherence: three longitudinal studies in rehabilitation. *Health Psychology, 27*, 854-863.
- Schwarzer, R., Richert, J., Kreasukon, P., Remme, L., Wiedemann, A. U., & Reuter, T. (2010). Translating intentions into nutrition behaviors via planning requires self-efficacy: Evidence from Thailand and Germany. *International Journal of Psychology, 45*(4), 260-268.

- Schwarzer, R., Schüz, B., Ziegelmann, J., Lippke, S., Luszczynska, A., & Scholz, U. (2007). Adoption and Maintenance of Four Health Behavior: Theory-Guided Longitudinal Studies on Dental Flossing, Seat Belt use, Dietary Behavior, and Physical Activity. *Annals of Behavioral Medicine, 33*(20), 156-66.
- Scrimshaw, S. C. (2008). College Students Can Prepare for a Healthy Life. *Spectrum*. Cambridge, MA: Aetna Student Health.
- Serdula, M. K., Ivery, D., Coates, R. J., Freedman, D. S., Williamson, D. F., & Byers, T. (1993). Do obese children become obese adults? A review of the literature. *Preventive Medicine, 22*(2), 167-77.
- Settlage, J. (2000). Understanding the learning cycle: Influences on abilities to embrace the approach by pre service elementary school teachers. *Science Education, 84*(1), 43–50.
- Serdula, M. K., Ivery, D., Coates, R. J., Freedman, D. S., Williamson, D. F., & Byers, T. (1993). Do obese children become obese adults? A review of the literature. *Preventive Medicine, 22*(2), 167-77.
- Seymour, M., Hoerr, S. L., & Huang, Y-L. (1997). Inappropriate dieting behaviors and related lifestyle factors in young adults: Are college students different? *Journal of Nutrition Education, 29*, 21-26.
- Shaalma, H., & Kok, G. (2009). Decoding health education interventions: the times are a-changin', *Psychology and Health, 24*(1), 5-9.
- Shaikh, A. R., Yaroch, A. L., Nebeling, L., Yeh, M. C., & Resnicow, K. (2008). Psychosocial predictors of fruit and vegetable consumption in adults: A review of literature. *American Journal of Preventive Medicine, 34*, 535–543.

- Shaikh, A. R., Yaroch, A. L., Nebeling, L., Yeh, M., & Resnicow, K. (2008). Psychosocial Predictors of Fruit and Vegetable Consumption in Adults. *American Journal of Preventive Medicine, 34*(6), 535-543.
- Sheeran, P. (2002). Intention – behavior Relations: A conceptual and empirical review. *European Review of Social Psychology, 12*, 1-36.
- Silverman, D., Underhile, R., & Keeling, R. P. (2008). Student Health Reconsidered: A Radical Proposal For Thinking Differently About Health-Related Programs and Services for Students. *Spectrum*. Cambridge, MA: Aetna Student Health.
- Sniehotta, F. F. (2009). Towards a theory of intentional behaviour change: Plans, planning and self-regulation. *British Journal of Health Psychology, 14*, 261-273.
- Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2006). Action plans and coping plans for physical exercise: A longitudinal intervention study in cardiac rehabilitation. *British Journal of Health Psychology, 11*, 23-37.
- Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2006). Action plans and coping plans for physical exercise: A longitudinal intervention study in cardiac rehabilitation. *British Journal of Health Psychology, 11*, 23–37.
- Sniehotta, F. F., Schwarzer, R., Scholz, U., & Schüz, B. (2005). Action planning and coping planning for long-term lifestyle change: Theory and assessment. *European Journal of Social Psychology, 35*, 565-576.
- Splette, P. L., & story, M. (1997). Child Nutrition: Objectives for the decade. *Journal of American Diet Association, 91*(6), 665-668.
- Stadler, G., Oettingen, G., & Gollwitzer, P. M. (2010). Intervention Effects of Information and Self-Regulation on Eating Fruits and Vegetables Over Two Years. *Health Psychology, 29*(3), 274–283.

- Stock, C., Wille, L., & Kraemer, A. (2001). Gender-specific health behaviors of German university students predict the interest in campus health promotion. *Health Promotion International, 16*(2), 145-154.
- Story, M., & Stang, J. (2005). *Guidelines for Adolescent Nutrition Services*. Minneapolis: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota; 2005. Retrieved from: URL:http://www.epi.umn.edu/let/pubs/adol_book.shtm
- Sutton, S. (2008). How does the Health Action Process Approach (HAPA) Bridge the Intention–Behavior Gap? An Examination of the Model’s Causal Structure. *Applied Psychology: An International Review, 57*(1), 66–74.
- Taymoori, P., & Lubans, D. R. (2008). Mediators of behavior change in two tailored physical activity interventions for adolescent girls. *Psychology of Sport and Exercise 9*, 605–619.
- Van Duyn, M. A., Kristal, A. R., Dodd, K., Campbell, M. K., Subar, A. F., Stables, G., Nebeling, L., & Glanz, K. (2001). Association of awareness, intrapersonal and interpersonal factors, and stage of dietary change with fruit and vegetable consumption: a national survey. *American Journal of Health Promotion, 16*(2), 69-78.
- Van Oostrom, S. H., Anema, J. R., Terluin, B., Venema, A., de Vet, H. C., & van Mechelen, W. (2007). Development of a workplace intervention for sick-listed employees with stress-related mental disorders: Intervention Mapping as a useful tool. *BMC Health Services Research, 7*, 127 doi:10.1186/1472-6963-7-127

- van Osch, L., Lechner, L., Reubsæet, A., Wigger, S., & de Vries, H. (2008). Relapse prevention in a national smoking cessation contest: Effects of coping planning. *British Journal of Health Psychology, 13*, 525-535.
- van Osch, L., Reubsæet, A., Lechner, L., Candel, M., Mercken, L., & de Vries, H. (2008). Predicting parental sunscreen use: disentangling the role of action planning in the intention – behavior relationship. *Psychology & Health, 23*(7), 829-847.
- Vermeulen, S. J., Anema, J. R., Schellart, A., van Mechelen, W., & van der Beek, A. J. (2009). Intervention mapping for development of a participatory return-to-work intervention for temporary agency workers and unemployed workers sick-listed due to musculoskeletal disorders. *BMC Public Health, 9*, 216 doi:10.1186/1471-2458-9-216
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology, 29*, 591-604.
- Walker, S. N., Sechrist, K. R., & Pender, N. J. (1987). The health-promoting lifestyle profile: development and psychometric characteristics. *Nursing Research, 36*, 76–81.
- Webb, T. L., & Sheeran, P. (2007). How do implementation intentions promote goal attainment? A test of component processes. *Journal of Experimental Social Psychology, 43*, 295-302.
- Weinstein, N. D. (1987). Unrealistic optimism about susceptibility to health problems: Conclusions from a community-wide sample. *Journal of Behavioral Medicine, 10*(5), 481-500.

- Weinstein, N. D. (2007). Misleading tests of health behavior theories. *Annals of Behavioral Medicine, 33*, 1-10.
- WHO. (2002). *The World Health Report, Reducing risks, promoting health*. Geneva, World Health Organization. Retrieved from <http://www.who.int/whr/2002/en/>
- Wiedemann, A. U., Schüz, B., Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2009). Disentangling the relation between intentions, planning, and behaviour: A moderated mediation analysis. *Psychology and Health, 24*, 67-79. doi: 10.1080/08870440801958214
- Wiedemann, A. U., Lippke, S., Reuter, T., Ziegelmann, J. P., & Schwarzer, R. (2011). How planning facilitates behaviour change: Additive and interactive effects of a randomized controlled trial. *European Journal of Social Psychology, 41*, 42-51. doi: 10.1002/ejsp.724
- Wiedemann, A. U., Lippke, S., Reuter, T., Ziegelmann, J. P., & Schüz, B. (2011a). The more the better? The number of plans predicts health behaviour change. *Applied Psychology: Health and Well-Being, 3*, 87-106. DOI: 10.1111/j.1758-0854.2010.01042.x
- Wolfers, M. E., van den Hoek, C., Brug, J., & Zwart, O. (2007). Using Intervention Mapping to develop a programme to prevent sexually transmittable infections, including HIV, among heterosexual migrant men. *BMC Public Health, 7*, 141.
- Working group on food-based dietary guidelines for Thai people: quantitative process. (2001). *Thailand nutrition flag, Healthy eating for Thais*. Institute of Nutrition, Mahidol University, Nutrition Division, Department of Health, Ministry of Public Health.
- World Health Organization (WHO). (2003). *Diet, Nutrition and the Prevention of Chronic Diseases*. (Report of a Joint WHO/FAO Expert Consultation. WHO

- Technical Report Series No. 916). Retrieved from https://www.who.int/dietphysicalactivity/publications/trs916/en/gsfao_introduction.pdf
- Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2006). Adoption and maintenance of physical activity: Planning interventions in young, middle-aged, and older adults. *Psychology and Health, 21*, 145–163.
- Ziegelmann, J. P., Luszczynska, A., Lippke, S., & Schwarzer, R. (2007). Are goal intentions or implementation intentions better predictors of health behavior? A longitudinal study in orthopedic rehabilitation. *Rehabilitation Psychology, 52*, 97-102.
- Ziegler, R. G. (1991). Vegetables, fruits, and carotenoids and the risk of cancer. *American Journal of Clinical Nutrition, 53*, 251S-259S.
- Zule, W. A., Coomes, C. M., Karg, R., Harris, J. L., Orr, A., & Wechsberg, W. M. (2010). Using a Modified Intervention Mapping Approach to Develop and Refine a Single-Session Motivational Intervention for Methamphetamine-Using Men Who Have Sex With Men. *The Open AIDS Journal, 4*, 132-140.

Appendices

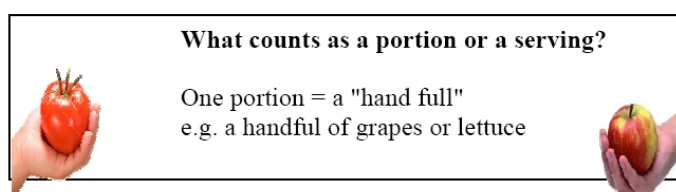
7.1 Appendix A: Instruments Employed in the Experimental Design in English and Thai Versions (only Thai version was used in the intervention)

- English Version of Instruments

1

Fruit and vegetable consumption

If you think about fruit and vegetables, please exclude cereal, potato products, high starch fruit and vegetables such as durian, yam, taro and jack fruit. Count each portion of fruit and vegetables, it does not matter how the fruit/ vegetable is prepared (for example, fresh, raw, frozen, cooked).



How many portions of enough fruit and vegetables you should take daily?

1. How many servings of fruit (eg. bananas, pineapples) are sufficient?
_____ Portion (s) per day
2. How many portions of vegetables (eg. kale, lettuce) are sufficient?
_____ Portion (s) per day
3. How many servings of fruit (eg. bananas, pineapples) you have eaten on average per day? Think of your last week consumption until today.
_____ Portion (s) per day
4. How many portions of vegetables (eg. kale, salad) you have eaten on average per day? Think of your last week consumption until today.
_____ Portion (s) per day
5. Are you having enough amount of fruit and vegetables in each day (5 portions)?
 - No and I do not intend to do it.
 - No but I think about doing it.
 - No but I intend to do it.
 - Yes I have fruit and vegetables 5 portions a day but it is difficult to do so.
 - Yes I have fruit and vegetables 5 portions a day without any difficulty.

How do you rate these statements?

	Not at all true ←—————→ Mostly true					
	1	2	3	4	5	6
6 I, myself, decide what I eat	1	2	3	4	5	6
7 Some other people have influence on what I eat	1	2	3	4	5	6
8 I think Fruit and vegetable consumption is important to my health	1	2	3	4	5	6

Risk perception

How likely is it you will have a sometime in your life...	Very Unlikely ←————→ Very Likely					
	1	2	3	4	5	6
... a high cholesterol level?	1	2	3	4	5	6
... some types of cancer?	1	2	3	4	5	6
... a heart disease?	1	2	3	4	5	6
... an obesity?	1	2	3	4	5	6

Intention to consume fruit and vegetable

How many portions of fruit (eg bananas, pineapples) do you intend to eat every day?
 _____ Portion (s) per day

How many portions of vegetables (eg kale, lettuce) do you intend to eat every day?
 _____ Portion (s) per day

Outcome expectancies (nutrition)

What do you think, what will be the consequences if you change your nutrition to more fruit and vegetables? If I eat healthy foods (more fruit and vegetables)...	Not at all true ←————→ Exactly true					
	1	2	3	4	5	6
I'll feel physically more attractive.	1	2	3	4	5	6
I won't have weight problems (anymore).	1	2	3	4	5	6
food won't taste as good.	1	2	3	4	5	6
that will impair my social life (at parties, with friends).	1	2	3	4	5	6
that will be good for my blood pressure.	1	2	3	4	5	6
I'll feel more comfortable mentally.	1	2	3	4	5	6
I'll have to make an effort of buying the right products.	1	2	3	4	5	6
that will be good for my cholesterol level.	1	2	3	4	5	6
I'll have to spend more time on preparing meals.	1	2	3	4	5	6
that will mean a loss of life quality for me.	1	2	3	4	5	6
that will be a burden for my financial situation.	1	2	3	4	5	6
other people will appreciate my willpower.	1	2	3	4	5	6

Planning to change nutrition habits

<p>(action planning) Most people would like to further <i>improve</i> their nutrition by taking in more fruit and vegetables. How about you? I already have concrete plans...</p>	<p>Not at all True \longleftrightarrow Extremely True</p>					
which fruit and vegetables to eat	1	2	3	4	5	6
when (or which situations) to eat fruit and vegetable	1	2	3	4	5	6
how to eat fruit and vegetables (eg. raw or cooked)	1	2	3	4	5	6
<p>(coping planning) Most people would like to further <i>improve</i> their nutrition habits by taking in more fruit and vegetables. How about you? I already have concrete plans...</p>	<p>Not at all True \longleftrightarrow Extremely True</p>					
when to especially watch out in order to maintain my sufficient portions of fruit and vegetables.	1	2	3	4	5	6
what to do in difficult situations in order to stick to my intentions.	1	2	3	4	5	6
how to deal with relapses	1	2	3	4	5	6

Self - efficacy (nutrition)

<p>Certain barriers make it hard to change one's nutrition habits. How <i>sure</i> are you that you can overcome the following <i>obstacles</i>? I can stick to a healthy diet (more fruit and vegetables) even...</p>	<p>Not at all True \longleftrightarrow Exactly True</p>			
...if I have to learn much about nutrition.	1	2	3	4
...if I initially have to watch out in many situations.	1	2	3	4
...if I have to start all over again several times until I succeed.	1	2	3	4
...if I initially have to make plans.	1	2	3	4
...if initially food doesn't taste as good.	1	2	3	4
...if I initially don't get much support.	1	2	3	4
...if I takes a long time to get used to it.	1	2	3	4
...if I have worries and troubles.	1	2	3	4
...if my partner/ my family don't change their nutrition habits.	1	2	3	4

Motivational self-efficacy (only for T1 assessment)

I am sure that I ...	Not at all true		←————→				Mostly true
... can eat enough fruit and vegetables daily, even if it is difficult for me.	1	2	3	4	5	6	
... can eat enough fruit and vegetables daily, even if it lacks of attractive shopping opportunities.	1	2	3	4	5	6	

Maintenance self - efficacy (only for T2 assessment)

I am sure that I can permanently eat sufficient amount of fruit and vegetables everyday, even if I ...	Not at all True		←————→				Extremely True
... have barriers to overcome (for example, that there is no fruit or vegetables to buy).	1	2	3	4	5	6	
... have worries and problems.	1	2	3	4	5	6	

Recovery self - efficacy (only for T3 assessment)

I am sure I can continue eating sufficient amount of fruit and vegetables again, even if I ...	Not at all True		←————→				Extremely True
... have not succeed in doing so for sometime.	1	2	3	4	5	6	
... have not eaten sufficient amount of fruit and vegetables for a long time.	1	2	3	4	5	6	

Demographic information

1. Age
2. Gender male female
3. Weight kg.
4. Height cm.
5. Academic year Faculty

- Thai Version of Instruments Used in Experimental design



1

แบบสอบถามครั้งที่ 1

ขอขอบคุณท่านเป็นอย่างยิ่งสำหรับความร่วมมือในการเข้าร่วมโครงการอบรมเพื่อการศึกษาวิจัยเกี่ยวกับการส่งเสริมพฤติกรรมสุขภาพ ขอให้ท่านกรุณาตอบแบบสอบถามเกี่ยวกับพฤติกรรมมาริโภคและเรื่องอื่น ๆ ที่เกี่ยวข้องตามความเป็นจริง ข้อมูลที่ได้จากท่านจะถูกเก็บเป็นความลับและนำไปใช้เพื่อประโยชน์ในการศึกษาวิจัยเท่านั้น

การบริโภคผักและผลไม้ (กรุณาอ่านคำชี้แจงก่อนตอบคำถาม)

เมื่อท่านนึกถึงผักและผลไม้ โปรดอย่ารวมถึงธัญพืช ผลิตภัณฑ์จากมันฝรั่ง รวมทั้งผักและผลไม้ที่มีแป้งหรือน้ำตาลมาก เช่น มันเทศ เผือก ทุเรียนและขนุน ขอให้นับผักและผลไม้เป็นหน่วยบริโภคหรือ "ส่วน" ที่รับประทาน ไม่ว่าจะรับประทานผักและผลไม้ในลักษณะใด (เช่น สด ดิบ แช่แข็ง หรือสุก) เช่น ผัก ผลไม้ 3 ส่วน หรือ 5 ส่วน ต่อวัน

	<p>อะไรคือหนึ่งหน่วยบริโภคหรือหนึ่งส่วน หนึ่งส่วน เท่ากับ ปริมาณผักหรือผลไม้ที่สามารถบรรจุได้ในหนึ่งอุ้งมือ</p> <p>ตัวอย่างการกำหนดปริมาณของผลไม้ที่เป็นผลหรือเป็นชิ้น หนึ่งส่วน เท่ากับ ส้มเขียวหวาน 1 ผล หรือกล้วยน้ำว้า 1 ผล หรือ มะละกอหรือสับปะรดหั่นเป็นชิ้นพอดีคำ 6 – 8 ชิ้น</p>	
------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------

1. ท่านคิดว่าควรรับประทานผลไม้ (เช่น กล้วย สับปะรด) จำนวนกี่ส่วนต่อวันจึงจะเพียงพอวันละ _____ ส่วน
2. ท่านคิดว่าควรรับประทานผัก (เช่น คื่นช่าย ผักกาดหอม) จำนวนกี่ส่วนต่อวันจึงจะเพียงพอวันละ _____ ส่วน
3. ในสัปดาห์ก่อน ท่านรับประทานผลไม้ (เช่น กล้วย สับปะรด) เฉลี่ยวันละ _____ ส่วน
4. ในสัปดาห์ก่อน ท่านรับประทานผัก (เช่น คื่นช่าย ผักกาดหอม) เฉลี่ยวันละ _____ ส่วน
5. ท่านรับประทานผักและผลไม้เป็นประจำทุกวัน วันละไม่น้อยกว่า 5 ส่วนหรือไม่ (เลือกเพียงหนึ่งคำตอบเท่านั้น)
 - ไม่ และฉันไม่คิดจะทำอย่างนั้นเลย
 - ไม่ แต่ฉันก็คิดว่าจะทำอย่างนั้นอยู่เหมือนกัน
 - ไม่ แต่ฉันมีความตั้งใจแน่วแน่ว่าจะทำอย่างนั้น
 - ใช่ ฉันรับประทานผักและผลไม้วันละ 5 ส่วน แต่รู้สึกว่ามันทำได้ยาก
 - ใช่ ฉันรับประทานผักและผลไม้วันละ 5 ส่วนได้โดยไม่รู้สึกยากลำบากเลย

ในข้อต่อไปนี้ กรุณาตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความเห็นของท่านที่แสดงด้วยตัวเลขตั้งแต่ 1 ถึง 6 โดยที่ 1 หมายถึง ไม่จริงเลย และ 6 หมายถึง จริงที่สุด

คำกล่าวต่อไปนี้สอดคล้องกับความ เป็นจริงเพียงใด	←—————→					
	ไม่จริงเลย					จริงที่สุด
6. ฉันตัดสินใจด้วยตนเองว่าจะ รับประทานอะไร	1	2	3	4	5	6
7. บุคคลอื่นมีอิทธิพลเกี่ยวกับสิ่งที่ฉัน รับประทาน	1	2	3	4	5	6
8. ฉันคิดว่าการบริโภคผักและผลไม้ไม่มี ความสำคัญต่อสุขภาพของฉัน	1	2	3	4	5	6

การรับรู้เกี่ยวกับสุขภาพของท่าน

กรุณาตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความเห็นของท่านที่แสดงด้วยตัวเลขตั้งแต่ 1 ถึง 6 โดยที่ 1 หมายถึง เป็นไปได้น้อยมาก และ 6 หมายถึง เป็นไปได้มาก

มีความเป็นไปได้เพียงใดที่ท่านจะมีความเสี่ยงต่อ โรคต่อไปนี้ ในช่วงเวลาใดเวลาหนึ่งในชีวิตของท่าน	←—————→					
	เป็นไปได้ น้อยมาก					เป็นไปได้ ได้มาก
1. ... ระดับคอเลสเตอรอลสูง	1	2	3	4	5	6
2. ...โรคมะเร็งบางชนิด	1	2	3	4	5	6
3. ...โรคหัวใจ	1	2	3	4	5	6
4. ...โรคอ้วน	1	2	3	4	5	6

ความตั้งใจเกี่ยวกับสุขภาพของท่าน

ตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความรู้สึกของท่าน โดยที่ 1 หมายถึง ไม่ตั้งใจเลย และ 6 หมายถึง ตั้งใจมาก

ท่านมีความตั้งใจอย่างไร ในอนาคตอันใกล้ (สัปดาห์หน้าและ/ หรือเดือนหน้า)?	ไม่ตั้งใจเลย \longleftrightarrow ตั้งใจมาก					
	1	2	3	4	5	6
1. ฉันตั้งใจที่จะใช้ชีวิตอย่างมีสุขภาพดีขึ้น	1	2	3	4	5	6
2. ฉันตั้งใจที่จะรับประทานอาหารที่ดีต่อสุขภาพมากที่สุดเท่าที่จะทำได้	1	2	3	4	5	6
3. ฉันตั้งใจที่จะรับประทานไขมันน้อยที่สุดเท่าที่จะทำได้ (หลีกเลี่ยงเนื้อติดมัน เนยแข็ง ฯลฯ)	1	2	3	4	5	6
4. ฉันตั้งใจที่จะรับประทานผักและผลไม้มากขึ้น	1	2	3	4	5	6

ในข้อต่อไปี้ กรุณาตอบโดยการเติมตัวเลขที่เหมาะสมลงในช่องว่าง

5. ท่านตั้งใจว่าจะรับประทานผลไม้ (เช่น กัลยวี สับปะรด มะละกอ ฯลฯ) วันละ _____ ส่วน

6. ท่านตั้งใจว่าจะรับประทานผัก (เช่น คื่นช่าย ผักกาดหอม กะหล่ำปลี ฯลฯ) วันละ _____ ส่วน

ความคาดหวังของท่านเกี่ยวกับการบริโภคผักและผลไม้

กรุณาตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความรู้สึกของท่าน โดยที่ 1 หมายถึง ไม่จริงเลย และ 6 หมายถึง จริงที่สุด

ท่านคิดว่า หากท่านเปลี่ยนไปรับประทานผักและผลไม้มากขึ้น จะมีผลลัพธ์อย่างไร?	ไม่จริงเลย \longleftrightarrow จริงที่สุด					
	1	2	3	4	5	6
1. ถ้าฉันรับประทานผักและผลไม้มากขึ้น ฉันจะรู้สึกว่ามีรูปร่างดีขึ้น	1	2	3	4	5	6
2. ถ้าฉันรับประทานผักและผลไม้มากขึ้น ฉันจะไม่มีปัญหาเรื่องน้ำหนักตัวอีกต่อไป	1	2	3	4	5	6
3. ถ้าฉันรับประทานผักและผลไม้มากขึ้น อาหารคงจะไม่อร่อยนัก	1	2	3	4	5	6
4. ถ้าฉันรับประทานผักและผลไม้มากขึ้น จะเป็นผลเสียต่อชีวิตทางสังคมของฉัน (การไปงานเลี้ยง การไปเที่ยวกับเพื่อน)	1	2	3	4	5	6
5. ถ้าฉันรับประทานผักและผลไม้มากขึ้น จะเป็นผลดีต่อความดันโลหิตของฉัน	1	2	3	4	5	6

ท่านคิดว่า หากท่านเปลี่ยนไปรับประทานผักและผลไม้มากขึ้น จะมีผลลัพธ์อย่างไร?	←→					
	ไม่จริงเลย					จริงที่สุด
6. ถ้าฉันรับประทานผักและผลไม้มากขึ้น ฉันจะเจริญอาหารมากกว่าแต่ก่อน	1	2	3	4	5	6
7. ถ้าฉันรับประทานผักและผลไม้มากขึ้น ฉันจะต้องใช้ความพยายามในการซื้อผักผลไม้ที่เหมาะสม	1	2	3	4	5	6
8. ถ้าฉันรับประทานผักและผลไม้มากขึ้น จะเป็นผลดีต่อระดับคอเลสเตอรอลของฉัน	1	2	3	4	5	6
9. ถ้าฉันรับประทานผักและผลไม้มากขึ้น ฉันจะต้องใช้เวลาทำกับข้าวมากขึ้น	1	2	3	4	5	6
10. ถ้าฉันรับประทานผักและผลไม้มากขึ้น จะทำให้ฉันสูญเสียคุณภาพชีวิต	1	2	3	4	5	6
11. ถ้าฉันรับประทานผักและผลไม้มากขึ้น จะเป็นภาระต่อสถานะทางการเงินของฉัน	1	2	3	4	5	6
12. ถ้าฉันรับประทานผักและผลไม้มากขึ้น คนอื่นจะชื่นชมความตั้งใจแน่วแน่ของฉัน	1	2	3	4	5	6

การวางแผนเปลี่ยนแปลงนิสัยด้านโภชนาการ

กรุณาตอบคำถามแต่ละข้อโดยคลิกลงในช่องที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความรู้สึกรู้สึกของท่าน โดยที่ 1 หมายถึง ไม่จริงเลย และ 6 หมายถึง จริงที่สุด

(AP) คนส่วนใหญ่ต้องการปรับปรุงโภชนาการของตนเองโดยการบริโภคผักและผลไม้มากขึ้น ส่วนท่านเองทำอย่างไร	←→					
	ไม่จริงเลย					จริงที่สุด
1. ฉันมีแผนอย่างเป็นทางการแล้วว่าจะรับประทานผักและผลไม้ชนิดใด	1	2	3	4	5	6
2. ฉันมีแผนอย่างเป็นทางการแล้วว่าจะรับประทานผักและผลไม้เมื่อใด (หรือในสถานการณ์ใด)	1	2	3	4	5	6
3. ฉันมีแผนอย่างเป็นทางการแล้วว่าจะรับประทานผักและผลไม้อย่างไร (เช่น ดิบหรือสุก)	1	2	3	4	5	6

(CP) คนส่วนใหญ่ต้องการปรับปรุงโภชนาการของตนโดยการบริโภคผักและผลไม้มากขึ้น ส่วนท่านเองทำอย่างไร	ไม่จริงเลย ←————→ จริงที่สุด					
4. ฉันมีแผนอย่างเป็นทางการเป็นรูปธรรมแล้วว่า เมื่อใดจะต้องใส่ใจเป็นพิเศษ เพื่อที่จะยังคงบริโภคผักและผลไม้ในปริมาณที่เพียงพอต่อไป	1	2	3	4	5	6
5. ฉันมีแผนอย่างเป็นทางการเป็นรูปธรรมแล้วว่า จะต้องทำอย่างไรในสถานการณ์ที่ยากลำบาก เพื่อทำตามความตั้งใจของฉันได้อย่างแน่นอน	1	2	3	4	5	6
6. ฉันมีแผนอย่างเป็นทางการเป็นรูปธรรมแล้วว่า จะแก้ปัญหาอย่างไรเมื่อฉันเริ่มกลับไปบริโภคอาหารที่ไม่ดีต่อสุขภาพ	1	2	3	4	5	6

การรับรู้ความสามารถของตนเอง (ด้านโภชนาการ)

กรุณาตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความรู้สึกของท่าน โดยที่ 1 หมายถึง ไม่จริงเลย และ 6 หมายถึง จริงที่สุด

อุปสรรคบางอย่างทำให้ยากที่จะเปลี่ยนแปลงนิสัยการบริโภคอาหารของคน ท่านมั่นใจเพียงใดว่าจะสามารถเอาชนะอุปสรรคต่อไปนี้	ไม่จริงเลย ←————→ จริงที่สุด					
1. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าฉันต้องศึกษาหาความรู้มากมายเกี่ยวกับโภชนาการ	1	2	3	4	5	6
2. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าในระยะแรก ฉันต้องคอยระมัดระวังในหลายสถานการณ์	1	2	3	4	5	6
3. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าฉันต้องเริ่มต้นใหม่หลายครั้งจนกว่าจะประสบผลสำเร็จ	1	2	3	4	5	6
4. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าในระยะแรก ฉันต้องวางแผน	1	2	3	4	5	6
5. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าในระยะแรก อาหารมีรสชาติไม่อร่อย	1	2	3	4	5	6
6. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าในระยะแรก ฉันไม่ได้รับการสนับสนุนมากนัก	1	2	3	4	5	6

6

อุปสรรคบางอย่างทำให้ยากที่จะเปลี่ยนแปลงนิสัยการบริโภคอาหารของคน ท่านมั่นใจเพียงใดว่าจะสามารถเอาชนะอุปสรรคต่อไปนี้	←→					
	ไม่จริงเลย					จริงที่สุด
7. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าฉันต้องใช้เวลาานกว่าจะคุ้นเคยกับมัน	1	2	3	4	5	6
8. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าฉันมีความกังวลและประสบการณ์ที่ย่างยาก	1	2	3	4	5	6
9. ฉันสามารถบริโภคผักและผลไม้มากขึ้น ถึงแม้ว่าคนรัก/ ครอบครัวของฉันไม่เปลี่ยนแปลงนิสัยการบริโภคอาหาร	1	2	3	4	5	6

ความมั่นใจในความสามารถของท่านในการบริโภคผักและผลไม้

กรุณาตอบคำถามแต่ละข้อโดยวงกลมรอบตัวเลขที่แสดงความหมายของคำตอบตามความเห็นของท่าน โดยพิจารณาจากระดับของความรู้สึกของท่าน โดยที่ 1 หมายถึง ไม่จริงเลย และ 6 หมายถึง จริงที่สุด

ข้อคำถาม	←→					
	ไม่จริงเลย					จริงที่สุด
1. ฉันมั่นใจว่าฉันสามารถรับประทานผักและผลไม้ในแต่ละวันในปริมาณเพียงพอ แม้ว่าเป็นเรื่องยากสำหรับฉัน	1	2	3	4	5	6
2. ฉันมั่นใจว่าฉันรับประทานผักผลไม้ในแต่ละวันในปริมาณเพียงพอ แม้ว่าแหล่งจำหน่ายผักและผลไม้ที่นั่นมีน้อย	1	2	3	4	5	6

ข้อมูลทั่วไป

ขอขอบคุณที่ท่านให้ความร่วมมือในการศึกษาวิจัยครั้งนี้ ส่วนนี้เป็นส่วนสุดท้ายกรุณาตอบคำถามต่อไปนี้โดยทำเครื่องหมาย ✓ ใน ○ หรือเขียนคำตอบในช่องว่าง

1. อายุ ปี
2. เพศ ○ ชาย ○ หญิง
3. น้ำหนัก กก.
4. ส่วนสูง ซม.
5. เป็นนักศึกษาปีที่ คณะ.....

“ขอขอบคุณท่านเป็นอย่างยิ่งสำหรับการตอบแบบสอบถาม”

7.2 Appendix B: Examples of Intervention Materials (English and Thai. Only

Thai version was used in intervention)

- General knowledge of nutrition and benefits of fruit and vegetable consumption



42

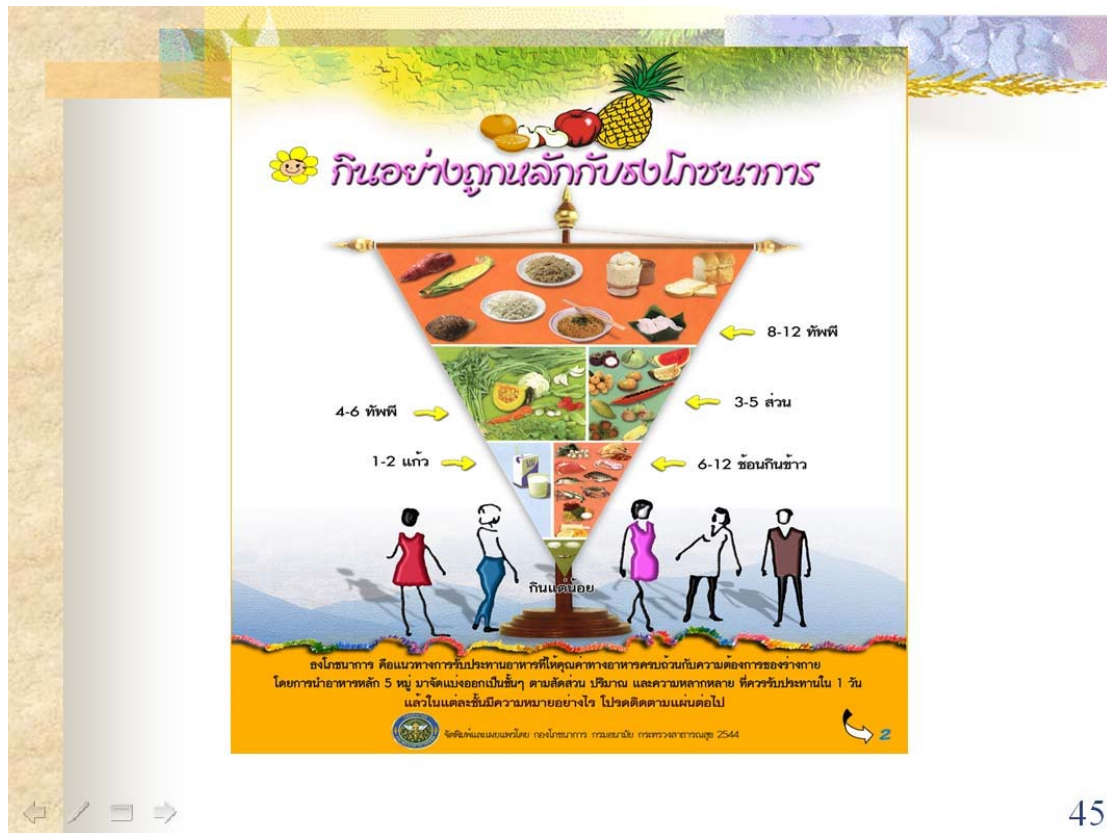
คุณทราบหรือไม่ว่า...?

- องค์การอนามัยโลก (World Health Organization: WHO) แนะนำหลักการบริโภคอาหารที่เป็นประโยชน์ไว้ดังต่อไปนี้
 - บริโภคอาหารที่มีความเหมาะสมในแง่ของการให้พลังงานและรักษาน้ำหนักตัวที่พอเหมาะพอดี
 - ลดปริมาณการบริโภคไขมัน และเปลี่ยนแปลงการบริโภคไขมัน จากไขมันอิ่มตัวไปเป็นการบริโภคไขมันประเภทไม่อิ่มตัว
 - เพิ่มการบริโภคผักและผลไม้ ผักใบเขียว ธัญพืช และถั่วต่าง ๆ ให้มากขึ้น
 - จำกัดการบริโภคน้ำตาลหรืออาหารรสหวานจัด
 - จำกัดการบริโภคเกลือจากทุกแหล่ง และหากจะต้องบริโภคเกลือบ้าง ควรเป็นเกลือที่มีไอโอดีนเท่านั้น

Source: World Health organization

44

- General knowledge of nutrition (continued)
 - o Thailand's nutrition flag



- o The meaning of “portion”

แล้วหนึ่งส่วน (portion) มันคือเท่าไรล่ะ ?

- ปริมาณเท่าไรจึงจะเรียกว่าหนึ่งส่วน ?

ส่วน = portion หรือ serving
 หนึ่งส่วน = ปริมาณขนาดหนึ่งอุ้งมือของเรา
 ตัวอย่างเช่น ผักโขมเขียว จำนวนผลไม้หั่นเป็นชิ้น หรือองุ่นที่สามารถบรรจุได้ในหนึ่งอุ้งมือ


- Self-efficacy intervention's presentation and handout

■ Try to recollect the circumstances in which this situation took place (Where was it? What type of food was it?). You may have felt some positive feelings that accompanied the successful achievement of your goal.

■ Please write down

.....

■ In any case, you can be proud of yourself now and feel that you are successful in achieving what you intended to do and sticking to your decisions.



33

■ คุณเคยประสบความสำเร็จในการหลีกเลี่ยงอาหารที่ไม่ดีต่อสุขภาพบ้างไหม?

เคย ไม่เคย

ถ้าเคย ช่วยเล่าว่าคุณได้ทำอย่างไร

.....

เมื่อคุณนึกถึงสถานการณ์ที่คุณตัดสินใจรับประทานอาหารหรือดื่มเครื่องดื่มที่มีประโยชน์ต่อสุขภาพแทนอาหารหรือเครื่องดื่มที่มีผลเสียต่อสุขภาพ (เช่น รับประทานผลไม้หรือผักหรือดื่มน้ำผลไม้ปั่นแทนน้ำหวานหรือน้ำอัดลม)

อย่างน้อยที่สุดบางครั้งคุณก็สามารถทำตามการตัดสินใจของคุณได้ ถึงแม้ว่าคุณอาจรับประทานอาหารที่มีผลเสียต่อสุขภาพก็ตาม



55

- Nutrition calendar aiming at fruit and vegetable consumption

(English and Thai)


5 days per weeks x at least 3 portions of fruit and vegetables

	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
Which activity	lunch			party			
When	12.00						
How much	3 portions	3 portions				3 portions	
Where	Uni. Café.	Food court	Pizza hut				
With whom	friends	alone	family		Girl friend	friend	

Tip: you should plan to add a "planning day" e.g. to go shopping for healthy foods or to prepare for healthy dish.

Furthermore, you should also spare a "relax day". Then you will feel that you are rewarded.

Do not forget extra time e.g. driving.



5 วันต่อสัปดาห์ x ผักและผลไม้อย่างน้อยที่สุด 3 ส่วน

	จ.	อ.	พ.	พฤ.	ศ.	ส.	อา.
กิจกรรมอะไร	อาหารกลางวัน			ปาร์ตี้			
เมื่อใด	12.00						
ปริมาณเท่าใด		3 ส่วน	3 ส่วน		3 ส่วน	3 ส่วน	3 ส่วน
ที่ไหน	คาเฟ่ มหาวิทยาลัย	ศูนย์อาหาร	พิซซ่าฮัท				
กับใคร	เพื่อนๆ	คนเดียว	ครอบครัว		แฟน	เพื่อน	

คำแนะนำ: คุณควรเพิ่ม "วันวางแผน" เช่น ไปซื้ออาหารเพื่อสุขภาพหรือปรุงอาหารเพื่อสุขภาพ

นอกจากนี้ คุณควรเจียดเวลาสำหรับ "วันพักผ่อน" ด้วย แล้วคุณจะได้รู้สึกว่าเป็นการให้รางวัลตัวเอง

อย่าลืมเวลาที่เพิ่มขึ้น เช่น การขับรถ



- Fruit and vegetable planning calendar handout (Thai)



เป้าหมายรองที่ 1 ของฉัน


(ตัวอย่าง เช่น ใน 3 วันต่อสัปดาห์ ฉันจะรับประทานผักและผลไม้อย่างน้อยวันละ 2 ส่วน)

	ทุกวัน	จันทร์ วันที่....	อังคาร วันที่....	พุธ วันที่....	พฤหัสบดี วันที่....	ศุกร์ วันที่....	เสาร์ วันที่....	อาทิตย์ วันที่....
กิจกรรม อะไร								
เมื่อใด								
ปริมาณ เท่าใด								
ที่ไหน								
กับใคร								



93


- Coping plan model and handout worksheet



What do other people do in order to overcome obstacles and stay engaged in healthy diet behaviors?

Barrier 1: Dining out with friends.

When I have to go dining out with friends, I keep in mind that I can still stick to healthy diet behaviors. So, instead of having fatty or unhealthy foods and snacks, I choose to have tuna salad and fresh fruits.



66

ใบงานที่ 7
 ลงเขียนแผนที่วางไว้ (เป้าหมาย 1) และ สิ่งเข้ามาขัดจังหวะ (เป้าหมาย 2)

เป้าหมาย 1:

กับ

เป้าหมาย 2:

คุณมีแนวทางแก้ไขความขัดแย้งนี้หรือไม่

โปรดเติมแนวทางแก้ไขของคุณ:

แนวทางแก้ไขของฉัน

.....

.....

.....

CURRICULUM VITAE

*For reasons of data protection
the curriculum vitae is not included in online version*

Erklärung

Hiermit versichere ich, dass ich die vorgelegte Arbeit selbstständig verfasst habe. Andere als die angegebenen Hilfsmittel habe ich nicht verwendet. Diese Arbeit ist in keinem früheren Promotionsverfahren angenommen oder abgelehnt worden.

Berlin, 31. March 2011

Pimchanok Kreasukon