A Causal Model of Lifestyle Modification Behaviors
in Thai Adults with Hypertension

Patcharawadee Tongnuang

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Author   Miss Patcharawadee Tongnuang

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ABSTRACT

This path analytic study was to examine the causal model of lifestyle modification behaviors in Thai adults with hypertension. A 240 Thai adults with hypertension were recruited at the out-patient clinics in five hospitals in Thailand through stratified random sampling. A set of six questionnaires was used to collect the data. The questionnaires were examined for their content validity by a panel of experts. The reliability of all the questionnaires was between .75 - .91. Data were analyzed using descriptive statistics and path analysis. The findings presented as follow;

1) The goodness of fit indices indicated that the final model fitted well with the data (χ^2/df =.95; p-value=.51; GFI=.99; AGFI=.99; CFI=1.00; NNFI=1.00; RSMEA=.00; SRMR=.03).

2) Fourteen paths of the total sixteen paths were statistically significant in the final model. Perceived behavioral control (PBC) and social support had positive and direct influences on lifestyle modification behaviors (β=.33, p <.001; β=.38, p <.001, respectively). Social support, desire, and PBC had a positive and direct influence on intention (β=.11, p <.05; β=.54, p <.001; β=.18, p <.01, respectively). Self-efficacy, intention, and PBC had a positive and direct influence on trying (β =.46,

p <.001; β=.18, *p* <.01; β=.18, *p* <.05, respectively). Attitude and illness identity directly affected PBC (β=.56, *p* <.001; β=-.18, *p* <.01, respectively). Attitude, social support, self-efficacy, and PBC influenced desire positively and directly (β=.26, *p* <.001; β=.17, *p* <.01; β=.20, *p* <.01; β=.29, *p* <.01, respectively).

3) Social support and PBC accounted for 38% of the total variance in lifestyle modification behaviors (R^2=.38).

The findings provided data for nurses and health personnel to develop interventions for promoting the lifestyle modification behaviors among adults with hypertension.

ชื่อวิทยานิพนธ์   แบบจำลองเชิงสาเหตุของพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่
                                   ไทยที่มีภาวะความดันโลหิตสูง

ผู้เขียน   นางสาว พัชราวดี ทองเนื่อง

สาขาวิชา   การพยาบาล (นานาชาติ)

ปีการศึกษา   2560

บทคัดย่อ

การศึกษาเชิงวิเคราะห์เส้นทางความสัมพันธ์เชิงสาเหตุนี้มีวัตถุประสงค์เพื่อทดสอบแบบจำลองเชิงสาเหตุของพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่ไทยที่มีภาวะความดันโลหิตสูง กลุ่มตัวอย่างเป็นผู้ใหญ่ที่มีภาวะความดันโลหิตสูงที่มาตรวจตามนัด ณ คลินิกผู้ป่วยนอกของโรงพยาบาลประจำจังหวัดในประเทศไทย จำนวน 240 คน ดำเนินการเลือกกลุ่มตัวอย่างด้วยวิธีการสุ่มแบบแบ่งชั้น เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามทั้งหมด 6 ชุด ที่ผ่านการตรวจสอบความตรงตามเนื้อหาโดยผู้ทรงคุณวุฒิ และมีความเที่ยงของแบบสอบถามอยู่ระหว่าง .75 – .91 วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาและสถิติเชิงวิเคราะห์เส้นทาง ผลการวิจัยพบว่า

1) โมเดลสุดท้ายของแบบจำลองเชิงสาเหตุของพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่ไทยที่มีภาวะความดันโลหิตสูง มีความสอดคล้องกลมกลืนกับข้อมูลเชิงประจักษ์ (χ^2/df = .95; p-value = .51; GFI = .99; AGFI = .99; CFI = 1.00; NNFI = 1.00; RSMEA = .00; SRMR = .03).

2) ค่าสัมประสิทธิ์เส้นทางจำนวน 14 เส้นทางจากทั้งหมด 16 เส้นทางของโมเดลสุดท้ายของแบบจำลองเชิงสาเหตุของพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่ไทยที่มีภาวะความดันโลหิตสูงมีนัยสำคัญทางสถิติ โดยการรับรู้การควบคุมพฤติกรรมและแรงสนับสนุนทางสังคม มีอิทธิพลทางตรงเชิงบวกต่อพฤติกรรมการปรับเปลี่ยนวิถีชีวิต (β=.33, p <.001; β=.38, p <.001 ตามลำดับ) แรงสนับสนุนทางสังคม ความปรารถนา และการรับรู้การควบคุมพฤติกรรม มีอิทธิพลทางตรงเชิงบวกต่อความตั้งใจ (β=.11, p <.05; β=.54, p <.001; β=.18, p <.01 ตามลำดับ)การรับรู้สมรรถนะแห่งคน ความตั้งใจ และการรับรู้การควบคุมพฤติกรรมมีอิทธิพลทางตรงเชิงบวกต่อความพยายาม (β =.46, p <.001; β=.18, p <.01; β=.18, p <.05 ตามลำดับ) เจตคติ และการรับรู้เกี่ยวกับความเจ็บป่วยมีอิทธิพลทางตรงต่อการรับรู้การควบคุมพฤติกรรม (β=.56, p <.001; β=-.18, p <.01 ตามลำดับ) เจตคติ แรงสนับสนุนทางสังคม การรับรู้สมรรถนะแห่งตน และการรับรู้การควบคุมพฤติกรรมมีอิทธิพลทางตรงเชิงบวกต่อความปรารถนา (β=.26, p <.001; β=.17, p <.01; β=.20, p <.01; β=.29, p <.01 ตามลำดับ)

3) โมเดลสุดท้ายของแบบจำลองเชิงสาเหตุสามารถอธิบายความแปรปรวนของพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่ไทยที่มีภาวะความดันโลหิตสูงได้ร้อยละ 38

ข้อค้นพบจากการศึกษาครั้งนี้สามารถใช้เป็นข้อมูลสำหรับพยาบาลและบุคลากรทางสุขภาพในการพัฒนาโปรแกรมเพื่อส่งเสริมพฤติกรรมการปรับเปลี่ยนวิถีชีวิตในผู้ใหญ่ที่มีภาวะความดันโลหิตสูง

Chapter 1

Introduction

This chapter describes the statement of the problem, objectives of the research, research questions, conceptual framework, hypotheses, operational definitions, and significance of the study.

Statement of the Problem

It is undeniable that hypertension (HTN) still is a significance health problem among worldwide adults. The World Health Organization (WHO, 2015) reported that adults aged 18 years and above raised blood pressure level in 2014 (24% in male and 20.5% in female, respectively). The global situation was similar in Thailand. The proportion of Thai adults who are diagnosed with high blood pressure increases each year and the situation of uncontrolled HTN still is a problem. In 2017, almost 2.2 million Thai adults aged from 15 to 59 years have been diagnosed with HTN and about 537,101 Thais became a new patient with HTN (excepting Bangkok) (Thai Ministry of Public Health, 2017). Among the Thai adults with HTN who were treated by medication, the rate of those with uncontrolled HTN was more than one-thirds in 2014 (Pangjunant & Panthuvaj, 2015). Adults with HTN could control blood pressure level continuously (at least two times) only 41.50 % in 2015 which decreased from 42.70% in 2014 (Bureau of Non-Communicable Disease Thailand, 2016).

Increased blood pressure is estimated by the WHO (2013) to be the leading risk factor for other illness and death. Uncontrolled HTN affected people's life. Severe complications caused from HTN such as diabetes mellitus, cardiovascular

disease (Breaux-Shropshire, Brown, Pryor, & Maples, 2012; Khan et al., 2007). The frequently occurring symptoms in patients with HTN (i.e. dizziness, headaches, and fatigue) induced discomfort both physically and mentally and increased the level of stressful emotions (Daskalopoulou et al., 2012; Jones, Tucker, & Herman, 2009). Furthermore, the working-age suffering from HTN would reduce the process of driving the economy in their country and on a personal level affects family income. Consistency, the highest percentage of raised blood pressure was found in low income adults (WHO, 2015). Thus, the prevention of complications and controlling blood pressure levels are the best strategies for reducing all effects of hypertension.

The treatment and control of blood pressure levels consist of pharmacologic treatment and non-pharmacologic treatment (Chobanian et al., 2003; Daskalopoulou et al., 2012; James et al., 2014). In consideration of non-pharmacologic treatment, a key strategy is a lifestyle modification (Chobanian et al., 2003; James et al., 2014; Rigsby, 2011; Rocha-Goldberg et al., 2010; Ruixing et al., 2009). The Thai Hypertension Society (2012) recommended that Thai adults with HTN should modify lifestyle behaviors such as weight control, dietary and salt consumption, alcohol consumption, and physical activity following on the USA guideline which was the 8th report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure [JNC-8] guideline in lifestyle recommendations (James et al., 2014). The combination between lifestyle modification behaviors and antihypertensive drugs can increase the efficiency of controlling blood pressure levels which is better than the use of single antihypertensive drugs. This combination can lower blood pressure levels by 2 mmHg to 11 mmHg (Fernandez, Scales, Pineiro,

Schoenthaler, & Ogedegbe, 2008; Khan et al., 2007; Rigsby, 2011; Rocha-Goldberg et al., 2010; Volger et al., 2007).

Although, many experimental studies in nursing were conducted in several past years, the failure of controlling blood pressure levels still increases in adults with HTN. It was possible that previous studies about the relationship between influencing factors and lifestyle modification behaviors did not clear understanding. Only one full causal model in Thais with HTN examined the adherence to therapeutic regimens (including taking medication behavior and lifestyle modification behaviors) and conducted in women (Pinprapapan, Panuthai, Vannarit, & Srisuphan, 2013). Thus, greater understanding about influencing factors and the causal relationship among factors and lifestyle modification behaviors would results in a greater intervention or program for controlling blood pressure levels in Thai adults with HTN.

Human behavior is complex. Understanding the causes of human behavior and how influencing factors such social factors, personal factors or, psychological factors shape behavior are necessary for modification behavior. Consequently, hypertension control requires lifestyle modification behaviors in several ways such as diet behavior, exercise behavior, stress management, alcohol consumption and smoking cessation, and weight reduction (Chobanian et al., 2003; James et al., 2014; Thai Hypertension Society, 2012). Prior to conducting an experimental study, a researcher who is interested in sustainable behaviors for controlling hypertension needs greater understanding about the behavioral patterns and factors which push people to behave in a certain way. A causal study is used to answer questions regarding the relationships between variables and to explain about understanding the phenomena under study (Munro, 2001). This challenges the researcher to think of the effects of

independent variables in more complex ways, which is the same as human behavior. To gain a clear picture of lifestyle modification behaviors for controlling HTN, it was important to turn back to the causal study.

The success of lifestyle behavior modifications depends on several factors. To propose the causal study, the literature review was carried out using the research database and restricted to (1) focusing on lifestyle modification behaviors; (2) adults with hypertension; (3) be published from 2005 through to 2014; and (4) be in English and Thai language. The selected variables were modifiable factors which can be improved and changed. The standardized regression coefficient (β) which is used to describe the predictive ability of each independent variable toward dependent variable should be more than .50 (Polit, 1996) or the odds ratio (OR) should be more than 1.00 (Davies et al., 1998). If it is lower than the criteria, the variable must be significant in several studies or the Thai context variable which was a significant variable in several studies in Thailand.

Furthermore, a greater understanding of the psychological factor of blood pressure control could lead to greater success in HTN control (Bosworth & Oddone, 2002). Psychological factors were defined as events of or relating to or determined by mental functions and were divided in two sub-categories; cognitive factor and affective factor. Moreover, social factor was a factor that influences on individual behavior attributable to the social values, particularly in Thai context. Both psychological factor and social factor which was named as "a psychosocial factor" were concerned for this study. Thus, eight variables such as attitude, perceived behavioral control (PBC), desire, intention, social support, illness identity, self-efficacy, and trying were met the criteria and selected to study.

Prior studies found that all eight selected variables influenced on lifestyle modification behaviors in adults with HTN. For example, Peters and Templin's study (2010) reported that attitude, PBC, and intention contributed to the explanation of blood pressure self-care behaviors (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) in African American adults with HTN. Desire was a strong and significant indirect influence on trying to reduce or maintain blood pressure level in previous studies (Baghianimoghadam, Aivazi, Mzloomy, & Baghianimoghadam, 2011; Taylor, Bagozzi, & Gaither, 2005).

Trying correlated with lifestyle modification behaviors in HTN. From the literature review, there are several previous studies that predicted trying for self-regulation in adults with hypertension. For instance, Taylor et al. (2005) found that PBC and past behavior explained variances in trying to self-regulate hypertension, with 56% in men and 50% in women. However, these previous studies examined trying as an outcome. Based on the MGB, trying plays a key process in intervening between intention and behavior (Taylor et al., 2005). No research examined the relationship between trying and lifestyle modification behavior in patients with HTN. In other disciplines, trying predicted high scores on weight control behavior in adults with HTN (β = .70, OR=1.11) (Andreyeva, Long, Henderson, & Grode, 2010; Zhao, Ford, Li, & Mokdad, 2009).

Social support significantly related to and predicted lifestyle behaviors in Thai patients with HTN (β = .13 – .46, OR = 1.59) (Baiya, 2011; Peamnoom, 2007; Pinprapapan, et al., 2013; Kebwai, 2006; Sukprungprom, 2008). Self-efficacy was empirically supported as predictors of lifestyle modification behaviors in adults with

hypertension (i.e. exercise behavior, eating behavior, and weight control) both in Thailand and other countries ($\beta = .35 - .54$, $r = .80 - .81$) (Pinprapapan et al., 2013; Warren-Findlow, Seymour, & Huber, 2012). Moreover, there was a little knowledge about illness identity among Thais. Illness identity had a negative direct influence on adherence to self-management (including healthy diet and exercise behavior) (Chen et al., 2011), and adherence to self-management (including healthy diet, unhealthy diet, exercise regimen, and appointment keeping) (Chen, Tsai, & Lee, 2009) among patients with HTN ($\beta = -.30$, $p < .05$). Thus, these eight explanatory variables were proposed in the model of this study.

Only four existing models of lifestyle modification behaviors in adults with HTN were found in Thailand and other countries in past several years such as the model of Goal-Directed Behavior (Taylor et al., 2005), the model of adherence to therapeutic regimens (focusing on healthy diet and exercise behavior) (Chen et al., 2011), the model of blood pressure control (Yang, Jung, & Choi, 2010), and the model of Adherence to Therapeutic Regimens (ATR) among Thai adults with hypertension (Pinprapapan et al., 2013). The proposed model differs from the existing models in three aspects; domain factors, intervening variable, and Thai context. Firstly, the model by Yang et al. (2010) examined only non-modifiable factors such as age, gender, and comorbidity. The three previous models proposed one or two domain factors (Chen et al., 2011; Pinprapapan et al., 2013; Taylor et al., 2005), whereas the proposed model examined three domain factors; affective factors, cognitive factors, and social factors.

Secondly, there were a difference intervening variables between existing models and this study. Intention and trying were intervening variables in this model.

These two intervening variables were selected from significant previous studies. The Thai existing model presented perceived self-efficacy as an intervening variable in the ATR model (Pinprapapan et al., 2013). In other countries, intention was proposed as intervening variables in a previous model by Taylor et al. (2005). In addition, the intervening variables in the model of adherence to therapeutic regimens were based on the three variables from the Common-Sense Model (Chen et al., 2011). Also, the model by Yang et al. (2010) did not present an intervening variable in the proposed model. All reasons clarified that the model in this study needed to propose and examine in Thai adults with HTN.

To fit with the Thai context, variables which relate to and predict lifestyle modification behaviors among Thai adults with HTN were concerned. Social support and self-efficacy were selected to propose in the model in several previous Thai studies because these variables had a significant influence on lifestyle modification behaviors among Thai adults with HTN (Baiya, 2011; Peamnoom, 2007; Pinprapapan et al., 2013; Kebwai, 2006; Sukprungprom, 2008). Also, self-efficacy was supported empirically as a positive predictor of lifestyle modification behaviors in Thai adults with HTN (i.e. exercise behavior, eating behavior, and weight control) (Kebwai, 2006; Khongchoom, 2009; Pinprapapan et al., 2013; Tantayothin, 2004).

In summary, there were few previous studies concerning psychosocial factors and there were limitations in the previous models of lifestyle modification behaviors in adults with HTN such as the Thai existing model was studied among women with HTN in one Northern Province in Thailand. A full causal model need to examine in Thais with HTN. The explanatory variables in this study such as attitude, perceived behavioral control, self-efficacy, desire, intention, social support, illness identity, and

trying were proposed in the model of lifestyle modification behaviors among Thai adults with HTN. The findings would help nurse to gain knowledge, increase skills, and develop competency for taking care patients because a nurse is a key person who has an important role to promote lifestyle modification behaviors in adults with HTN. Significant variables would be applied to develop the integrated intervention for Thai adults with HTN. Also, the results would be promoted in Thai adults with HTN to take proper care of themselves in order to obtain the best way to control blood pressure levels.

Objective

The purpose of this study was to examine the proposed relationships among selected explanatory variables and lifestyle modification behaviors for hypertension. The eight explanatory variables were: attitude, perceived behavioral control, desire, intention, trying, social support, self-efficacy, and illness identity.

Research Questions

The research questions in this study were as follows:

1. Did the initial model fit with the data?

2. Did intention have a positive direct influence on trying and lifestyle modification behaviors and a positive indirect influence on lifestyle modification behaviors through trying?

3. Did trying have a positive direct influence on lifestyle modification behaviors?

4. Did desire have a positive direct influence on intention and a positive indirect influence on trying via intention; and lifestyle modification behaviors via intention and trying?

5. Did attitude have a positive direct influence on intention and lifestyle modification behaviors, and a positive indirect influence on trying via intention; and lifestyle modification behaviors through intention and trying?

6. Did perceived behavioral control have a positive direct influence on trying, intention, and lifestyle modification behaviors; and a positive indirect influence on trying via intention; and a positive indirect influence on lifestyle modification behaviors via trying and intention?

7. Did self-efficacy have a positive direct influence on lifestyle modification behaviors?

8. Did social support have a positive direct influence on lifestyle modification behaviors?

9. Did illness identity have a negative direct influence on lifestyle modification behaviors?

Conceptual Framework

According to review literatures, the previous studies presented that there were many modifiable and non-modifiable factors influencing lifestyle modification behaviors in adults with hypertension. Nonetheless, only eight explanatory variables were selected in proposed model because these variables were modifiable factors, powerful predictors, significant in several previous studies, or relevant to Thai context. These eight explanatory variables were divided in two aspects; variables

based on the Model of Goal-Directed Behavior (MGB) and empirical variables. To adequately understand explanatory variables related to lifestyle modification behaviors in adults with hypertension, it was essential to explore these explanatory variables using a suitable theoretical model. The appropriate theory which was guided for the conceptual framework in this study was the Model of Goal-directed Behavior (MGB) and was combined with empirical variables which consisted of self-efficacy, trying, social support and illness identity.

According to the MGB, this model was proposed by Perugini and Bagozzi (2001). The model has been expanded from the Theory of Planned Behavior (TPB) (Ajzen, 1991) which seeks to account for actions and maintains that these are a direct function of behavioral intentions and perceived behavioral control, and indirect functions through behavioral intentions, of attitude, subjective norms and perceived behavioral control. Perugini and Bagozzi (2001) argued that TPB focused on the action as the target, rather than the process of decision making, prior to intention formation, to perform action with the manifest purpose to reach a specific goal.

In addition, the TPB model specifies that action was the target referent of all dependent variables, where as the MGB focused not on action, but rather upon the achievement of personal goals by adding predictors that were anticipated emotions. Because of the failure to consider how intentions became energized in TPB, Perugini and Bagozzi (2001) expanded the desire to directly perform the behavior through intention in the MGB. Desire, attitude, subjective norm, and perceived behavioral control provide reasons for acting that a decision maker took into account for self-commitment to act. Therefore, the Model of Goal-Directed Behavior (MGB) showed the important roles in the decision making process prior to the intention formation for

achieving a goal and was driven directly by the desire to perform the goal-directed behavior.

The Model of Goal-directed Behavior prescribed that desires served as essential mediators and gave the direct force for intentions and transformed the motivational content to act which were rooted in attitudes toward the act, anticipated emotion, subjective norms, and perceived behavioral control. Desires, intentions and behavior were predicted from the frequency of past behavior whereas only behavior was predicted by the recency of past behavior. To explain goal striving, anticipatory emotions were predictors of volitions to act and function dynamically in response to actual or imagined feedback. Desire act as an integrative role wherein the different, and potential competing, reason for acting were resolved into a self-conclusion that one desires to act or not (Taylor et al., 2005).

Concerning in hypertension population, the MGB by Perugini and Bagozzi (2001) was not examined in this population. Nevertheless, Baghianimoghadam et al. (2011) and Taylor et al. (2005) had been tested hypotheses about variables which based on the MGB by Perugini and Bagozzi (2001) among patients with hypertension. The results of two studies supported the hypotheses. According to the humanism perspective used in the Model of Goal-directed Behavior to explain how individuals carry out with the intention of improving their health, this view was served as a basis for understanding the hypertensive adult's health motivation as well. Commitment to achieving and maintaining control of his or her blood pressure was required for successful hypertension management. Consequently, this study proposes to examine the proposed model of lifestyle modification behaviors among Thai adults with HTN,

and the selected explanatory variables related to lifestyle modification behaviors involved which were as follows:

Attitude was defined as a personal belief about the behavior influences from the value that the person lay with the result of performing the behavior (Peters & Templin, 2010). In this study, attitude was defined as a person's positive or negative belief of self-performance of the behavior modification in hypertension. Peters and Templin (2010) found that attitude toward blood pressure control had an indirect influence on blood pressure self-care behaviors (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) via intention ($\beta = .87$, $p < .05$). Furthermore, Sukprungprom (2008) found that attitude concerning health promotion directly affected the health promotion of hypertension patients ($\beta = .13$, $p < .05$). Therefore, attitude was expected to have direct and indirect influences on lifestyle modification behaviors among Thai adults with HTN, through intention.

Perceived behavioral control in adults with hypertension was defined as an individual's perceived ease or difficulty, and facilitates or impedes performance to adopt lifestyle modification behaviors in hypertension. Peters and Templin (2010) indicated that a person's beliefs as probability that various factors (e.g. insurance, finance, family, or work responsibilities) would facilitate/impede their ability to keep blood pressure levels down as well as how often those facilitators/barriers occurred in the person's life. Many researchers had explored the influence of perceived behavioral control on behavior change. According to the review of the literature, perceived behavioral control was found to correlate most frequently with lifestyle modification behaviors among adults with hypertension (Corne´lio et al., 2012; Peters & Templin,

2010) and had a direct influence on lifestyle modification behaviors in adults with HTN ($\beta = .14 - .52$). Therefore, perceived behavioral control was a part of the proposed model.

Desire represented the motivational state of mind wherein appraisals and reasons to act are transformed into motivation to do so. Perugini and Bagozzi (2001) proposed that desire provided the motivational impetus for intentions, that is, one was aware of and accepts his or her desire to act, and this would motivate him or her to form an intention. Desire served as essential mediators between attitude, subjective norms, anticipated emotions, and perceived behavioral control, which was a reason for acting that a decision maker takes into account to form a self-commitment to act (Taylor et al., 2005). According to previous studies, desire had a positive relationship and a positive direct influence on intention for BP control ($\beta = .30 - .83$, $r = .46-.51$) (Baghianimoghadam et al., 2011; Taylor et al., 2005). Therefore, desire for lifestyle modification behaviors was expected to have indirect influence on lifestyle modification behaviors through intention among Thai adults with HTN, and thus was included in this study.

Intention was assumed to capture the motivational factors that influenced a behavior, and it was indicated by how hard people are willing to try, how much of an effort people are planning to exert, in order to perform the behavior (Ajzen, 1991). Intention was as an indication of an individual's readiness to lifestyle modification behaviors in hypertension. Many prior studies had explored the influence of intention for changing behavior. Intention was found to correlate most frequently with lifestyle modification behaviors among adults with HTN and had a positive direct influence on the behaviors ($\beta = .33 - .78$, $r = .42 - .63$) (Baghianimoghadam et al., 2011; Peters &

Templin, 2010; Taylor et al., 2005). Therefore, intention was a part of the proposed model.

Furthermore, additional variables from empirical literature were investigated for correlation of lifestyle modification behaviors among Thai adults with HTN. **Illness identity** was one of additional variables that influenced lifestyle modification behaviors in adults with HTN. Illness identity referred to the label or name given to the condition and the symptoms that appeared to go with an illness (Leventhal, Brissette, & Leventhal, 2003). When a symptom was presented, patients usually looked for causes of the illness and change their actions to cope with the illness. In regards to the management of HTN, the majority of patients who have no symptoms with hypertension do not feel unwell and therefore, this may encourage noncompliance. According to previous studies, illness identity had a negative direct influence on adherence to self-management (including healthy diet, unhealthy diet, exercise regimen, and appointment keeping) in adults with HTN (Chen et al., 2009; Chen et al., 2011).

An additional variable, social support was included in this study as a predictor of lifestyle modification behaviors among Thai adults with HTN. **Social support** was defined as information leading one to believe that he or she belongs to one or more of the following three classes: care for or loved, esteemed and valued, and belonging to a network of communication and mutual obligation (Cobb, 1976). In consideration to lifestyle modification behaviors in adults with HTN, social support referred to the adult's evaluation about the frequency of receiving informational, emotional, and instrumental assistance from family members, friends, medical and health personnel. These activities could help adults with HTN move toward the goal of lifestyle

modification behaviors. Several previous studies found that social support (getting encouragement) appeared to be an important determinant of success in motivation to change and maintain behaviors for HTN control (Heymann, Gross, Tabenkin, Porter, & Porath, 2011; Kebwai, 2006; Purateeranrath, 2011; Sukprungprom, 2008). Thus, social support was assumed that had a direct and positive influence on lifestyle modification behaviors.

Moreover, **trying** played a key process intervening between intentions and behavior. To fulfill an individual's goal, he/she must see his/her own action as a purposive attempt where foresight and effort are needed (Taylor, Bagozzi, & Gaither, 2001). Trying was defined as an individual assessment of how much effort one will expend or has expended in goal pursuit which he or she tries in the senses of devoting time to planning, expending mental/physical energy, maintaining will power, and sustaining self-discipline (Taylor et al., 2005). For example, in the goal of reducing blood pressure, patients seek their tasks such as taking medication, exercising, following a healthy diet, reducing salt consumption, and performing relaxation as one of trying to do the things needed to reach this goal. Based on the definition of trying from Taylor et al. (2001, 2005), there was no study examining the relationship between trying and behaviors in adults with HTN. In order to explain the role of trying following the MGB, thus trying was examined in this study.

Self-efficacy was defined as an individual's confidence in his/her ability to perform a specific behavior (Bandura, 1997 cited in Pinprapapan et al., 2013). Helping individuals understand that hypertension was a manageable condition could increase their confidence about living with a chronic disease (Warren-Findlow et al., 2012). Findings from previous studies, perceived self-efficacy was an important

influencing on dietary behavior, exercise behavior, weight management, and salt consumption in adults with HTN (Lee, Han, Song, Kim, Kim, Ryu, & Kim, 2010; Tantayothin, 2004; Wingo et al., in press). In Thailand, Pinprapapan et al. (2013) described that perceived self-efficacy had a positive and direct influence on adherence to therapeutic regimens (i.e., lifestyle modification and medical adherence) among adults with HTN in Northern Thailand ($\beta = .54$, $p < .01$). Similarly, Khongchoom (2009) found that self-efficacy positively influenced on complication prevention behaviors (including eating-salt, fat, alcohol, exercise, weight control, and stress) in Thai hypertensive patients ($\beta = .40$, $p < .05$).

In summary, based on theory and the literature review, the proposed model of lifestyle modification behaviors in Thai adults with HTN was assessed. The path was made based on the results from previous studies. The hypothesized model of lifestyle modification behaviors in Thai adults with HTN was presented in Figure 1. Attitude was expected to have both positive direct and indirect influence, through intention, and on lifestyle modification behaviors. Desire was expected to have a positive and indirect influence on lifestyle modification behaviors through intention. Perceived behavioral control was expected to have both positive direct and indirect influence, through intention and trying, and on lifestyle modification behaviors. Intention was expected to have positive direct and indirect influence through trying, and on the lifestyle modification behaviors. From the literature review, selected explanatory variables were added in this study. Illness identity was proposed as having a negative direct influence on lifestyle modification behaviors. Social support was expected to have a positive and direct influence on lifestyle modification behaviors. Likewise, trying was proposed as having a positive direct influence on lifestyle modification

behaviors and self-efficacy was expected as a having a positive and direct influence on lifestyle modification behaviors.

Figure 1. The hypothesized model of lifestyle modification behaviors in Thai adults with HTN
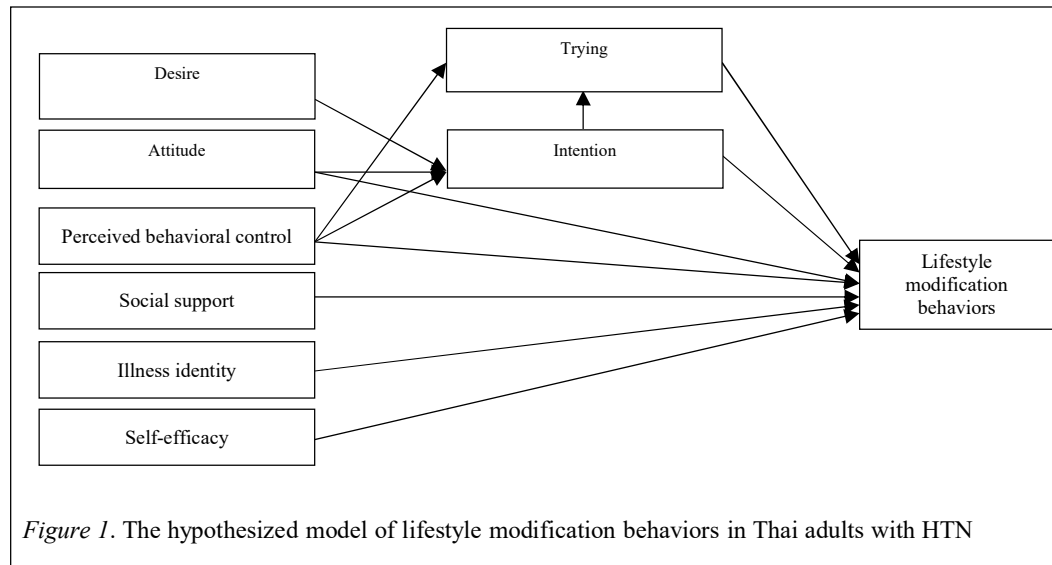
Hypotheses

There were causal relationships among the lifestyle modification behaviors in Thai adults with HTN including attitude, desire, perceived behavioral control, intention, self-efficacy, social support, illness identity, and trying. The specific hypotheses are as follows;

Hypothesis 1

The initial model fits with the data.

Hypothesis 2

2a) Intention would have a positive and direct influence on trying and lifestyle modification behaviors,

2b) intention would influence on lifestyle modification behaviors positively and indirectly via trying.

Hypothesis 3

Trying would have a positive and direct influence on the lifestyle modification behaviors.

Hypothesis 4

4a) Desire would influence on intention positively and directly,

4b) desire would influence on trying and lifestyle modification behaviors positively and indirectly through intention.

Hypothesis 5

5a) Attitude would have a positive and direct influence on intention and lifestyle modification behaviors,

5b) attitude would positively and indirectly affect trying and lifestyle modification behaviors through intention.

Hypothesis 6

6a) Perceived behavioral control (PBC) would have a positive and direct influence on trying and lifestyle modification behaviors,

6b) PBC would have a positive and indirect influence on lifestyle modification behaviors through intention and trying.

Hypothesis 7

Self-efficacy would have a positive and direct influence on lifestyle modification behaviors.

Hypothesis 8

Social support would influence on lifestyle modification behaviors positively and directly.

Hypothesis 9

Illness identity would have a negative and direct influence on lifestyle modification behaviors.

Operational Definitions

The major explanatory variables of interest in the study of lifestyle modification behaviors among Thai adults with hypertension consisted of desire, attitude, perceived behavioral control, intention, trying, illness identity, self-efficacy, and social support.

Attitude was defined as an individual belief of self-performance of lifestyle modification behaviors for hypertension such as unpleasant-pleasant, bad-good, and unhappy-happy. Attitude was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) developing by Taylor et al. (2005).

Perceived behavioral control was defined as an individual's perceived ease or difficulty, and power to control factors for lifestyle modification behaviors in adult with hypertension. Perceived behavioral control was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) developing by Taylor et al. (2005).

Desire was defined as a sense of intensity or level of wanting to act lifestyle modification behaviors in Thai adults with hypertension. Desire was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) developing by Taylor et al. (2005).

Intention was defined as an individual's readiness to perform lifestyle modification behaviors in hypertension. Intention was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) developing by Taylor et al. (2005).

Trying was defined as an individual assessment of how much effort one will expend or has expended in his or her goal pursuit which he or she tries in the sense of devoting time to planning, expending mental/physical energy, maintaining will power, and sustaining self-discipline. Trying was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) developing by Taylor et al. (2005).

Social support was defined as an individual's perception about receiving help or assistance from a person with whom they are in a personal relationship with during the past month. Social support consisted of emotional support, instrumental support, informational support, and appraisal support. It was evaluated by a person's score on the Hypertensive Social Support Scale which was developed by Pinprapapan (2013).

Self-efficacy was defined as an individual's confidence in his/her ability to perform lifestyle modification behaviors to control blood pressure levels such as symptom control, role function, emotional functioning, and communicating with physicians. Self-efficacy was measured by the Hypertensive Perceived Self-efficacy Questionnaire (HSEQ) which applied from the Self-Efficacy for Managing Chronic Disease 6-Item Scale (SES6C) by the Standard Patient Education Research Center (2012).

Illness identity was defined as an individual's perception about symptoms and factors causing complications of hypertension such as headaches,

fatigue, or blurred-vision. Illness identity was applied from the Thai version of Illness Identity Scale (Thai-IIS) which was developed by Leelacharas (2005).

Lifestyle modification behaviors were defined as an action for changing behavior in Thai adults with HTN which was recommended for blood pressure control and consisted of: (1) *physical activity or exercise* was defined as any bodily movement produced by the contraction of skeletal muscles that increase energy expenditure such as regular physical aerobic activity by engage in most of the day at least 30 minutes per day, (2) *dietary consumption* was defined as an eating behavior which is low in saturated fat, cholesterol, and total fat and emphasizes fruits, vegetables, and fat-free or low-fat milk and milk products, and a low salt diet for reducing or maintaining blood pressure levels, following the DASH eating plan, (3) *avoiding risks behavior* was defined as the limitation of alcohol to no more than 2 drinks per day for most men and to no more than 1 drink per day for women in a reduction of blood pressure levels, including avoiding smoking cigarettes or cigars, caffeine consumptions, and activities that increase high blood pressure level such as stretching, cough, or lifting (4) *stress management* was defined as an activity for relieving emotions or a coping behavior such as relaxation techniques, massage, or using imagination, and (5) *seeking follow up* was defined as an activity for visiting or consulting health care team to take care themselves for maintain blood pressure level. Lifestyle modification behaviors were measured by the Lifestyle Modification Behaviors Questionnaire (LMBQ) which modified from the Adherence to Lifestyle Modifications Questionnaire was developed by Limcharoen (2006).

Significance of the Study

A causal model of lifestyle modification behaviors in Thai adults with hypertension expanded the empirical knowledge for nursing. The results of this study were expected to contribute the nursing knowledge by explaining the influencing factors such as attitude, perceived behavioral control, desire, intention, trying, social support, self-efficacy, illness identity of lifestyle modification behavior in adults with hypertension.

Also, the study findings were expected to guide nurses for promoting lifestyle modification behaviors in adults with hypertension by design and develop interventions or program for enhancing the lifestyle modification behavior in adults with hypertension. Understanding the influencing factors of lifestyle modification behaviors might be fundamental for developing the lifestyle modification behaviors programs in Thai adults with HTN.

The study results provided evidences to further conduct intervention studies in order to explore the most appropriate strategies to improve lifestyle modification behaviors among Thai adults with hypertension. An experimental study might be designed to test for effectiveness in adults with HTN based on the study findings. Moreover, the results provided the empirical knowledge for nurse researchers. The results might be useful as basic knowledge for conduct studies to test the model with different populations (such as male-adults, female-adults) in similar settings.

Chapter 2

Literature Review

A review of the literature focusing on the conceptualization of hypertension (HTN), lifestyle modification behaviors (LMB) in Thai adults with hypertension, the theory or concept related to the selected variables, the influencing factors of lifestyle modification behaviors in adults with hypertension, and a causal model as well as a causal relationship between the explanatory variables and lifestyle modification behaviors in Thai adults with hypertension were presented in this chapter.

Overview of Hypertension

      1. Situations of hypertension in Thai adults

      2. Definition, classification, cause and pathophysiology of HTN

      3. Global and Thai Policies related to hypertension

      4. Treatments and control of hypertension

      5. Barriers to control hypertension in Thai adults

Lifestyle Modification Behaviors (LMB) for Adults with Hypertension

      1. Definition of Lifestyle modification behaviors

      2. The components of lifestyle modification behaviors

      3. Existing measurements of lifestyle modification behaviors

      4. Factors influencing lifestyle modification behaviors in Thai adults with hypertension

Selected Factors Relate to Lifestyle Modification Behaviors in HTN

1. Factors based on Model of Goal Directed Behavior

1.1) Definition and the components of MGB

1.2) Existing measurements of MGB in hypertension

2. Empirical factors

2.1) Trying

2.2) Self-efficacy

2.3) Social Support

2.4) Illness identity

The Causal Relationship among Selected Variables and LMB

Summary

Overview of Hypertension

1. Situations of hypertension in Thai adults

It is undeniable that hypertension is a silent killer disease which is the health problem among people, especially in adult and elderly aged group. Approximately 40% of adults aged 25 years and above were diagnosed with hypertension in 2008, worldwide. In addition, the World Health Statistics reported that one in three adults worldwide had raised blood pressure in 2012 (WHO, 2013). Among those with hypertension, the number of people with uncontrolled hypertension rose from 600 million in 1980 to nearly 1 billion in 2008. The World Hypertension League (WHL, 2015) found that increasing of blood pressure attributed about 18% of deaths (9.4 million) and 162 million years of life lost in 2010. Approximately 4 in 10 adults over age 25 have hypertension and in many countries another 1 in 5 has pre-hypertension. The highest percentage of raised blood pressure was found in low income adults (WHO, 2015).

In Thailand, the proportion of the adult population who are diagnosed with high blood pressure increases each year. There was a dramatic increase in the number of new patients with hypertension from the past to the 2008 and more than 11 million Thai people had hypertension (Panthuvaj & Apinya, 2011). Furthermore, the numbers of people with hypertension were approximately 3.4 million people between 2008 and 2012 and there were about 602,548 people with hypertension in 2012 (Thonghong, Thepsittha, Jongpiriyaanan, & Gappbirom, 2013). From the report of screening of hypertension in 2014 by the Bureau of Policy and Strategy in Thailand (2015), just over 1 million Thai people were diagnosed with hypertension. In addition, about 9.7% of adult who had risk with hypertension in 2013 became to hypertensive patient in

2014. Recently, Thai Ministry of Public Health (2016) reported that the number of Thai adults with hypertension who aged between 40 and 59 years in 2015 was about 25 million persons. Almost 6 millions Thai people, aged from 15 to 79 years old, have been diagnosed with hypertension in 2015 (Bureau of Non Communicable Disease Thailand, 2016). In 2017, almost 2.2 million Thai adults aged from 15 to 59 years have been diagnosed with HTN and about 537,101 Thais became a new patient with HTN (excepting Bangkok) (Thai Ministry of Public Health, 2017).

Looking more closely at Thai males and females with hypertension in 2008, the percentage of females with hypertension who were aged more than 15 years old was the same as males, with 21.3% and 21.5%, respectively (National Health Examination Survey Office Thailand, 2009). There has been an upward trend in the number of females with hypertension from 2008 to 2012. The proportion of females who were diagnosed with hypertension in 2012 was at 1.70 times higher than that of males with hypertension. Also the incidence rate of females with hypertension was still higher than males in 2012, at 1,160.89 and 706.95 per 100,000 of the population, respectively (Thonghong et al., 2013). The Annual Report 2015 revealed that the prevalence rates of adult with HTN were found 16.6 in female and 13.7 in male (Bureau of Non Communicable Disease Thailand, 2016).

The percentage of both males and females with hypertension has also increased sharply in the older age groups. For instance, National Health Examination Survey Office Thailand (2009) reported that more than 70% of all people with hypertension are aged more than 60 years old. After 2008, the highest number of hypertensive people was in those aged over 60 years old at about 330,641 people; whereas, the number of adults with hypertension was about 270,119 in 2012

(Thonghong et al., 2013). Also, more than half of patient with hypertension in 2015 was found in patient who aged above 65 years (Bureau of Non Communicable Disease Thailand, 2016).

Moreover, people with hypertension tend to live in urban areas more than in rural areas, with 26.8% and 19% of all people who were aged more than 15 years old, respectively (National Health Examination Survey Office Thailand, 2009). Also, Bureau of Non Communicable Disease Thailand (2016) reported that the prevalence rates of patient with hypertension in urban was higher than rural in 2015, at 17.2 and 14.1, respectively. Focusing on areas, in 2012, the highest number of new patients diagnosed with hypertension in Thailand was found in Nan Province at about 3,155.03 per 100,000 people with hypertension. The second and third highest numbers were in Suratthani and Prachinburi Province, with 2,967.35 and 2,879.09 per ten thousand people with hypertension, respectively (Thonghong et al., 2013). Thus, the number of people with hypertension is dispersed over every part of Thailand. In 2011, about 3 million Thai people who were aged more than 35 years old have been diagnosed with hypertension (Thai Ministry of Public Health, 2012). Two years later, the Bureau of Non Communicable Diseases (2013) reported that almost one hundred thousand Thai people had been diagnosed with hypertension, especially in the North and Northeast of Thailand in 2013.

Among those with hypertension who were treated by medication, the percentage of Thai people with uncontrolled hypertension in 2008 was approximately 20.7%. The percentage of females who did not control their blood pressure levels was higher than males, at 24.0% and 15.8 %, respectively (Panthuvaj & Apinya, 2011). According to the regions, the central of Thailand (which does not include Bangkok

province) had the highest percentage of people with uncontrolled hypertension in 2008, at 21.9% of Thai people who were aged over 15 years old (National Health Examination Survey Office Thailand, 2009). By 2012, the percentage of new patients who could not control their blood pressure levels was about 1.42% (8,567 persons) of all new patients with hypertension (Thonghong et al., 2013). Recently, the Medical Research Network of the Consortium of Thai Medical School (2014 cited in Pangjunant & Panthuvaj, 2015) reported that hypertensive adults could control blood pressure level continuously (at least three times) only 30.5 per cent in 2014.

Moreover, the Bureau of Policy and Strategy in Thailand reported that in-patients with hypertension increased 3.8 times in the decade from 2000 to 2009 (Panthuvaj & Apinya, 2011), and the morbidity rate of in-patients with hypertension has increased each year from 2005 to 2010 also (Thai Ministry of Public Health, 2012). Because of uncontrolled hypertension, more than one million people were in-patients with hypertension (in Bangkok, Nakhon Ratchasima, and Khon Kaen, respectively) and the morbidity rate of in-patients with hypertension was nearly four thousand people which increased from 2002 to 2011 (Bureau of Non Communicable Disease, 2013). From over one million hypertensive patients in 2013, only 215,647 patients could control their blood pressure levels (Bureau of Non Communicable Disease, 2013).

Increased blood pressure is estimated by the WHO (2013) to be the leading risk factor for death. The rate of mortality from conditions associated with hypertension increased from 24.3 in 2007 to 35.8 in 2011 (Thai Ministry of Public Health, 2012). The mortality rate of Thai adults with hypertension between October 2016 and April 2017 was about 8,620 persons (excepting Bangkok) (Thai Ministry of

Public Health, 2017). Moreover, hypertension among the working-age group has reduced the process of driving the economy and generating income for the country. The number one cause of death which is associated with hypertension in this age group is cerebrovascular disease which has caused an equal number of deaths for males and females at 23,741 and 21,546, respectively (Wibulpolprasert, 2011).

2. Definition, classification, cause and pathophysiology of hypertension

2.1 Definition and classification

Hypertension (HTN), known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. The World Health Organization (WHO, 2013) defined hypertension as a systolic blood pressure equal to or above 140 mmHg and/or diastolic blood pressure equal to or above 90 mmHg. The Seventh Report of the Joint National Committee (Chobanian et al., 2003) has provided a classification of blood pressure for adults aged 18 and over which is classified as 1) normal level: systolic blood pressure less than 120 and diastolic blood pressure less than 80 mmHg 2) pre-hypertension: systolic blood pressure 120 – 139 mmHg or diastolic blood pressure 80 – 89 mmHg 3) stage 1 hypertension: systolic blood pressure 140 - 159 mmHg or diastolic blood pressure 90 - 99 mmHg and 4) stage 2 hypertension: systolic blood pressure more than 159 mmHg or diastolic blood pressure more than 99 mmHg.

Moreover, three possible classifications of hypertension are denoted by the underlying cause of high blood pressure readings (Byrd, 2004). One classification is "white coat hypertension". Occasionally, when blood pressure is measured it may be higher than it usually is. For some people, the anxiety of visiting a doctor may temporarily raise their blood pressure. The second classification, "essential

hypertension", is caused by physical conditions such as a narrowing of the arteries, an abnormally high volume of blood in the body, or the heart beating too fast or too forcefully. The third classification, "secondary hypertension", is where hypertension is a product of some other medical condition, such as kidney disease.

2.2 Cause and pathophysiology of hypertension

Normally, blood is carried from the heart to all parts of the body in blood vessels. Each time the heart beats, it pumps blood into the vessels. Blood pressure is created by the force of blood pushing against the walls of blood vessels (arteries) as it is pumped by the heart. Abnormally high blood pressure is generally divided into the following two main categories:

2.2.1 Essential or primary hypertension

It is the most prevalent type, affecting between 90-95% of patients with hypertension. The cause of essential hypertension has not been directly identified, but its pathophysiology is assumed to be multifactorial (Dufton, 2011). There are many risk factors for the development of essential hypertension including: consumption of foods containing too much salt and fat, and not eating enough fruit and vegetables, harmful levels of alcohol use, physical inactivity and lack of exercise, poor stress management, visceral obesity, hypokalemia (potassium deficiency), sodium sensitivity, vitamin D deficiency, and obesity (Dufton, 2011; WHO, 2013).

The causes and pathophysiology of essential hypertension are far less understood. However, there are three theories proposed to explain this issue which are: 1) the kidneys are unable to properly excrete sodium, which results in natriuretic factors (such as atrial natriuretic factor) being over-secreted to promote salt excretion, leading to increased peripheral resistance as a side effect; 2) an overactive

renin-angiotensin system leads to vasoconstriction and retention of excessive sodium and water, which increases blood volume and leads to hypertension; and 3) an overactive sympathetic nervous system, due to a variety of factors mentioned above, leads to increased stress responses that involve excessive secretion of hormones that affect blood vessel diameter and blood pressure (Dufton, 2011).

2.2.2 Secondary hypertension

The remaining 5-10% of hypertension cases is classified as secondary hypertension. Secondary hypertension results from an identifiable cause, usually a disease that affects hormone synthesis and excretion (Dufton, 2011). There are also several metabolic factors that increase the risk of heart disease, stroke, kidney failure and other complications of hypertension, including diabetes, high cholesterol and being overweight or obese (Dufton, 2011; WHO, 2013). Tobacco and hypertension interact to further raise the likelihood of cardiovascular disease.

3. Global and Thai Policies related to hypertension

Non-communicable diseases such as cardiovascular disease, cancer, diabetes and chronic lung diseases have overtaken infectious diseases as the world's leading cause of mortality. One of the key risk factors for cardiovascular disease is hypertension (WHO, 2013). Among those with hypertension, the number of people with uncontrolled hypertension rose from 600 million people in 1980 to nearly 1 billion people in 2008 (WHO, 2013).

3.1 Global policies related to hypertension

In response to the global epidemic of non-communicable diseases, the World Health Organization launched a Global Plan of Action (GAP), for 2013-2020 which is "to reduce the preventable and avoidable burden of morbidity, mortality and

disability due to non-communicable diseases and raise the priority accorded to the prevention and control of non-communicable diseases in global" (WHO, 2013). By the end of this action plan, the indicators for monitoring hypertension are specified as; at least 25% of relative reduction in risk of premature mortality, at least 30% of relative reduction in mean population intake of salt/ sodium, and at least 25% of relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances. In addition, the United Nations has agreed that reducing hypertension by 25% and dietary sodium by 30% should be attained in 2025.

Recommended polices to prevent and control hypertension through improve diet and increase physical activity are outlined by the World Health Organization (WHO). To achieve these goals, several strategies were launched. For example;

1) Publishing Hypertension Guidelines: WHO, other organizations, and expert committees have designed several strategies and the guidelines for controlling blood pressure. For example, the International Society of Hypertension (ISH) and American Society of Hypertension (ASH) have established the guidelines for hypertension. The guidelines have been written to provide a straightforward approach to managing hypertension in the community for practitioners in low and middle-income countries as well as developed countries (International Society of Hypertension, 2014). Expert committees such as the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure have developed the guidelines for preventing and controlling hypertension over several past years. Recently, the report of JNC-8 guidelines (James et al., 2014) was published and

is aimed to provide an evidence-based approach to the prevention and management of hypertension which can be applied for managing hypertension in each country.

       2) Promoting hypertension campaigns: Focusing on campaigns for the prevention and control of hypertension in adults who are in the workforce group, the United Nations has launched a project called "Healthy workplace" (WHO, 2014). The objective of this project is to promote and create an enabling environment for healthy behaviors among workers. The project is focused on establishing tobacco-free workplaces and safe and healthy working environments through occupational safety and health measures.

       The programs of this project can help achieve the WHO objectives of reducing the avoidable deaths of non-communicable diseases and the burden of mental illness and to protect and promote health at the workplace as stipulated in the Global Plan of Action on Workers' Health 2008-2017. The main activities are the promotion and support of healthy behaviors and broader social and environmental determinants. This project encourages the lifestyle modification behaviors among adults with hypertension, because this age group spends more of their time in the workplace than at home. Therefore, the project could facilitate the workers to change lifestyle behaviors easily.

       Strengths and weaknesses of global hypertension policies

       In regards to strengths and weaknesses, the global policies to prevent and control hypertension are analyzed. Focusing on the strengths of global policies, these policies have goals, objectives, and strategies that are clear and appropriate. The policy making process has been derived from present situations, evidence-base studies, expert committees, and representatives from countries around the world.

Global policies provide a roadmap for country led action for the prevention and control of non-communicable diseases including hypertension. Thus, global policies are a decentralization policy which may increase the convenience of putting policies into practice at a national level.

Health global policies, action plans and the guidelines that are published are up to date by WHO, experts, and other organizations for the prevention and control of hypertension. In looking at the weaknesses of health global policies, it was found that the global policy for the prevention and control of hypertension was combined with other non-communicable diseases policy and the policy makers did not specify a target group such as the adult workforce.

3.2 Thai policies related to hypertension

In Thailand, the government has made an effort to implement policies for reducing hypertension rates from the past to the present (Thai Ministry of Public Health, 2012). Based on the Ottawa Charter, several policies have been formulated by several governments. In 2007, the National Health Act Thailand (National Health Commission Office, 2007) was established for promoting health. One aim of the Act is focusing on health prevention and receiving appropriate medical treatment as well as encouraging people to take proper care of their own health.

By 2014, the new government of Thailand provided the national policy which is related to health development focusing on health promotion and quality of life across the life span among the Thai population. As for workforce populations, the Ministry of Public Health Thailand established the National Health Policy focusing on screening, management, and reducing risk behaviors in this group such as smoking behavior, alcohol consumption, drug addiction, and risk behaviors which lead to

communicable and non-communicable diseases, (Bureau of Policy and Strategy, 2014).

The National Economic and Social Health Board Office, Ministry of Public Health, and Institute of Nutrition, Mahidol University together with various agencies, established the long-term Thailand Healthy Lifestyle Strategic Plan B.E. 2554-2563 (2011–2020) (The Thai Ministry of Public Health, 2012) for empowering people, communities, the society, and the nation. This will create potential and immunity to prevent emerging health problems rooted in unhealthy lifestyles. The major targeted behavior-related diseases are directed in four aspects of reduction: disease, complications, death, and expenditure by increasing a healthy lifestyle in two areas: appropriate consumption and sufficient physical exercise to balance energy and weight.

In addition, this plan was established for preventing and controlling five non-communicable chronic diseases such as cancer, cerebrovascular disease, heart disease, diabetes, and hypertension. At the end of this plan which focuses on hypertension, the committees expect that the percentage of people aged 35 years or older who received screening for hypertension will be less than 90%, the percentage of pre-hypertension people who are diagnosed with hypertension will be less than 10%, the percentage of new patients with hypertension will be less than 8%, and the percentage of patients with hypertension who receive screening of the complications of hypertension will be less than 60% (The Thai Ministry of Public Health, 2012).

To achieve the policies, the Ministry of Public Health and experts have designed strategies, research frameworks, and hypertensive guidelines.

1) Hypertension guidelines published: There are two guidelines which were found for preventing and controlling hypertension such as the "Guideline for self-management in hypertension" (Tanyamai, Pothisat, Achayindee, & Khonleud, 2012) and "the Guidelines on the treatment of hypertension update 2012" (Thai Hypertension Society, 2012).

2) Promoting hypertension campaigns: the campaign for increasing healthy lifestyle behaviors and reducing complications were designed for preventing and controlling hypertension. For instance, the Thai Health Promotion Foundation (2014) and a private corporation launched the "NCDs disease, you build by yourself campaign". It is a project to promote lifestyle modification behaviors for the prevention of NCDs which include hypertension and other five non-communicable diseases. The main activities of this project are promoting lifestyle modification behaviors including reducing alcohol consumption, quitting smoking, avoiding high lipid and salty foods, increasing fruit and vegetable consumption, performing exercise at least 30 minutes/day (5 times/week), and reducing stress.

Also, the Thai Ministry of Public Health and two private corporations launched the "Campaign for reducing salt consumption" in 2012 (Thai Health Promotion Foundation, 2014). This campaign is aimed at promoting appropriate salt consumption in all populations. To achieve the goal of the campaign, the project has been expanded to all hospitals in Thailand. Several main activities have been provided for, such as all hospitals have been assigned by the Thai Ministry of Public Health for promoting lower salt consumption, and several restaurants have been asked for their cooperation to control salt consumption levels and add healthy foods to their menus.

Monitoring and evaluating Thai policies

In regards to the monitoring and evaluation of the national health policy, in 2012 the Ministry of Public Health evaluated the Thailand Health Strategic Plan. Some results found that about 21.3% of target populations had been screened for hypertension and 5.62% of pre-hypertensive people were diagnosed with hypertension (Thai Ministry of Public Health, 2012). (Compared to the expectation of ending plan, the results had not evaluated the goal because the plan was still in an initial phase.

National Health Security Office Thailand (2014) has revealed the outcomes which are related to the prevention and control of hypertension and diabetes in 2014. They found that there were 663 nurses who are case manager experts in 77 provinces. There are 199 persons who are part of the system management team in 51 provinces. Compared to the prevalence rate of hypertension in 2009, the incidence rate of accessibility for services in hypertension has increased rapidly. The fatality rate from hypertension has also increased slightly from 7.17 to 7.95 per 100,000 of the population between 2010 and 2013. Regarding the health policies, some strategies could significantly affect the prevention and control of hypertension, whereas other strategies still affected slightly. Thus, these results should be concern in developing strategies in the future.

Strengths and weaknesses of Thai policies

Thai health policies related to the prevention and control of hypertension have been analyzed. The contents of Thai health policies have been described clearly in the goals, objectives, and strategies of the policies. The formulation process of a policy must receive agreement on the goals and strategies from experts and several organizations; however the key stakeholders such as

hypertensive clients, have had less participation in this process. According to the change of government leadership in the past ten years, national health policies have changed and discontinued to put policies into practice, and this is the one issue in regards to the weaknesses in Thailand. Strong leadership and commitment are necessary to ensure the follow through, resources, and accountability needed to force a policy into practice.

Furthermore, the Thai health policy has been disseminated and understood by the person who is responsible for the implementation in the prevention and control of hypertension; however most of the clients or stakeholders have received the information about these policies when they visit health care services. Thai health policies are still decentralized in their planning, so participation among stakeholders, health care teams, and related organizations in the community could strongly affect policy implementation for the prevention and control of hypertension. It is also interesting to note that, some powerful stakeholders have not been engaged in any policy implementation. In addition, some of the documents of the hypertensive guidelines were published from other countries which do not fit with the Thai population. Thus, evidence and research studies are needed to support the design of guidelines which fit with Thai adults with hypertension. The strength of the policies is that several campaigns and projects have promoted healthy lifestyle behaviors for the general population, based on the national health policy. However, these projects have not been specifically directed at adults with hypertension and these campaigns have focused on the prevention incidences of hypertension more than the control of hypertension. Therefore, it is necessary to, specifically plan for adults with hypertension in future promotions.

4. Treatments and control of hypertension

Success to prescribe lifestyle modifications, adequate antihypertensive drug doses, or appropriate drug combinations may result in adequate blood pressure control (Chobanian et al., 2003; Daskalopoulou et al., 2012; WHO, 2013).

4.1 Goals of Therapy

The ultimate public health goal of antihypertensive therapy is to reduce cardiovascular and renal morbidity and mortality. Treating systolic blood pressure and diastolic blood pressure to targets that are <140/90 mmHg is associated with a decrease in cardiovascular disease complications. In patients with hypertension and diabetes or renal disease, the BP goal is <130/80 mmHg. This is similar with the JNC-8 hypertension guidelines in which patients with hypertension who are aged 30 to 59 years require treatment for lowering systolic blood pressure goals at < 140 mmHg and diastolic blood pressure goals at < 90 mmHg (James et al., 2014).

4.2 Pharmacological Treatment

According to pharmacological treatment, some patients diagnosed with hypertension require medication. Initiating drug therapy should be recommended when blood pressure levels are higher than the systolic goal or diastolic goal (James et al., 2014). In addition, WHO (2013) suggests that hypertensive patients who have a medium to high risk will need one or more of eight essential medicines to lower their cardiovascular risk such as a thiazide diuretic, an angiotensin converting enzyme inhibitor, a long-acting calcium channel blocker, a beta blocker, metformin, insulin, a statin and aspirin. In hypertensive patients with lower BP goals or with substantially elevated blood pressure, three or more antihypertensive drugs may be required (Chobanian et al., 2003).

4.3 Non - Pharmacological Treatment

A key strategy for the non-pharmacologic treatment in hypertension is lifestyle modification (Chobanian et al., 2003; Rigsby, 2011; Rocha-Goldberg et al., 2010; Ruixing et al., 2009) which helps people to prevent hypertension and control blood pressure levels. The New JNC-8 hypertension guidelines still follow the JNC-7 guidelines in lifestyle recommendations and emphasize that the lifestyle treatment has the potential to improve blood pressure control and even reduce medication needs (James et al., 2014). The lifestyle modification consists of weight reduction, adopting the Dietary Approach to Stop Hypertension [DASH] eating plan, sodium reduction, physical activity, and limiting alcohol consumption (Chobanian et al., 2003).

5. Barriers to control hypertension in Thai adults

Poor blood pressure control is a serious problem in adults with hypertension. The failure of controlling blood pressure still is a significant problem in patients with hypertension. Most of them are not successful in the goal of lowering blood pressure levels to those which are recommended by the guidelines. The barriers of controlling blood pressure levels were found in the three aspects of personal barrier, social barrier, and health system barrier.

5.1 Personal barrier: It consists of knowledge, awareness, or intention. These barriers induced the patient to fail in controlling his or her blood pressure level. Most patients have not reached the goal blood pressure level. Brown et al. (2007) found that little knowledge was the one problem for the management of hypertension. Lack of knowledge about 'what to do' and 'how to do' in patients and relatives were obstacles for controlling blood pressure levels (Ford et al., 2010; Lee, Watson, Mulvaney, Tsai, & Lo, 2010; Middleton, 2009; Nangyaem, 2007).

In regards to the symptoms of hypertension, lack of knowledge about various symptoms of hypertension leaded people to be unaware of their blood pressure status (Kusuma, 2009). Leelacharas (2009) revealed that Thai people with hypertension often were not aware of the fact that they had high blood pressure levels because the hypertension symptoms were not clear for them. Furthermore, Gee et al. (2012) suggested that a low desire, interest, or awareness were commonly reported as barriers to salt restriction, changes in diet, weight loss, smoking cessation, and alcohol reduction in adults with hypertension.

5.2 Socio-environment barrier: a suitable environment and surrounding people such as relatives and friends affect and help a patient to control his or her blood pressure. For example, the weather and safety were barriers related to exercise among people with hypertension (Ford et al., 2010; Mansyur, et al., 2013). A lack of an accessible place for physical activity was a barrier to control blood pressure, particularly in Muslim women who have limitations in exercising or participating in activities outside the home (Somjaree, 2007). Also, fear of sustaining injuries could impede an exercise regimen (Scisney-Matlock et al., 2009). In examining eating behaviors among people with hypertension, Chobanian et al. (2003) found that the popularity of eating fast food or readymade meals was important barriers in controlling blood pressure levels. Furthermore, the difficulty of cooking separate meals for themselves and their families was a barrier in women with hypertension also (Ford et al., 2010).

5.3 Health care service barrier: the role of health care providers was the last barrier that could impede a patient to gain success in controlling his or her hypertension. For instance, the limitations of patient-clinician communication

regarding goals, plans, and feedback were related to poorly controlled blood pressure levels (Brown et al., 2007). Lack of goal setting for hypertension control (Brown et al., 2007; Chen et al., 2011), and lack of confidence in a patient's ability to fulfill the essential behavior to achieve a desired goal (Scisney-Matlock et al., 2009) induced a lack of intention for the continual change in the lifestyle behaviors of adults with hypertension. Likewise, a lack in the frequency of appointments, insufficient lifestyle counseling, and lack of awareness of some of the components of the guidelines for hypertension management could limit success in lifestyle modification behaviors (Chanathip, 2009; Scisney-Matlock et al., 2009). Therefore, poorly controlled blood pressure focusing on lifestyle modification behaviors could be linked to several factors of concern in development programs or interventions for people with hypertension.

Lifestyle Modification Behaviors (LMB) for Adults with Hypertension

      1. Definition of lifestyle modification behaviors

The JNC-7 guideline (Chobanian et al., 2003) mentioned that the lifestyle modification behaviors (LMB) was the self-care behaviors that were recommended for blood pressure control which included physical activity, weight reduction, dietary behavior, sodium reduction, alcohol consumption, and stress management. In 2014, the New JNC-8 Hypertension guideline (James et al., 2014) was published for the management in adults with hypertension. Most of the details of the new guidelines were changed in relation to treatment goals and drug therapy based on strong evidences. For example, in the general population who are aged 30 through to 59

years with diastolic $\geq$ 90 mmHg should initiate drug therapy to reduce blood pressure to a diastolic goal less than 90 mmHg.

According to the literature review, the LMB was examined vary in term of LMB in hypertension previous studies. Also, some studies examined some behaviors which was a part of all behaviors in LMB, and others studied all. For example, Peters and Templin (2010) used a term of "blood pressure self-care behaviors" following the JNC-7 guideline which consisted of low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco. Chen et al. (2009) and Chen et al. (2011) examined adherence to self-management (including diet pattern, exercise regimen, and appointment keeping) in adults with HTN which assessed about behavioral domains of self-management activities. In Thai studies, Khongchoom (2009) used a term of "complication prevention behaviors" including eating-salt, fat, alcohol, exercise, weight control, and stress management to study among HTN patients. Sukprungprom (2008) examined "health promoting behaviors of HTN patients" which consisted of six aspects such as health responsibilities, nutrition behavior, physical activity, interpersonal relations, stress management, and spiritual growth. Although there were difference terms to examine the LMB, some similar behaviors in LMB were examined in several previous studies. Thus, the term of "lifestyle modification behaviors (LMB)" was used, and all behaviors of the LMB recommending by the JNC-7 and -8 guidelines were examined in this study. The definition of lifestyle modification behaviors in HTN in this study was one's ability to control oneself for changing undesirable behavior to maintain normal blood pressure levels or reduce high blood pressure levels.

2. Components of lifestyle modification behaviors

In consideration of lifestyle recommendations, which was a key strategy for the non-pharmacologic treatment in hypertension, was lifestyle modification behaviors (Chobanian et al., 2003; Rigsby, 2011; Rocha-Goldberg et al., 2010; Ruixing et al., 2009). The New JNC-8 followed the JNC-7 and emphasized that the lifestyle treatment has the potential to improve blood pressure control and even reduce medication needs (James et al., 2014). According to the JNC-7 (Chobanian et al., 2003), it was stated that lifestyle modification behaviors to prevent and manage hypertension consisted of weight reduction, adopting the Dietary Approach to Stop Hypertension [DASH] eating plan, sodium reduction, physical activity, and limiting alcohol consumption. These behaviors have an effect on systolic blood pressure, fasting glucose, high-density lipoprotein cholesterol, or low-density lipoprotein cholesterol levels (Cakir & Pinar, 2006; Dickinson et al., 2006; Miura et al., 2006; Oh et al., 2008; Rigsby, 2011).

The success of lifestyle modification behaviors could increase the efficiency of antihypertensive drugs, because the combination between lifestyle modification behaviors and antihypertensive drugs could increase the efficiency of controlling blood pressure levels which is better than using of a single antihypertensive drug. This combination could lower blood pressure levels by 2 mmHg to 11 mmHg (Fernandez et al., 2008; Khan et al., 2007; Rigsby, 2011; Rocha-Goldberg et al., 2010; Volger et al., 2007). Greater intake of fruit and vegetables, lower sodium intake, and greater levels of physical activity were successful in lowering BP (Fernandez et al., 2008). Also increased physical activity for controlling weight gain has been recommended as an important behavior to prevent and control hypertension (Lee et al., 2010), because

systolic differences were in line with previous reviews of 1 kg:1 mmHg relationship (Aucott, Rothnie, McIntyre, Thapa, Waweru, & Gray, 2009).

Modified behaviors consisted of eating a low salt diet, eating to obtain or maintain a healthy weight, and getting regular cardiovascular exercise (Middleton, 2009). Gee, Bienek, McAlister, Robitaille, Joffres, Tremblay, & Campbell (2012) mentioned that blood pressure control consisted of increasing physical activity, decreasing smoking, and alcohol consumption. In addition, Ruixing et al. (2009) recommended that lifestyle modification behaviors such as limiting alcohol consumption, quitting smoking and increasing physical activity levels, and decreasing dietary intake of; salt, fat, protein and dietary cholesterol could decrease blood pressure levels. Similarly, the Thai Hypertension Society (2012) recommended that Thai adults with hypertension should modify the following five health pattern behaviors; weight control, dietary consumption, salt consumption, alcohol consumption, and physical activity. In summary, the components of lifestyle modification behaviors in adults with hypertension from previous studies were as follows;

2.1 Physical activity or exercise

Physical activity or exercise was defined as any bodily movement produced by the contraction of skeletal muscles that increase energy expenditure above resting levels and comprises of routine daily tasks such as regular physical aerobic activity by engage in most of the day at least 30 minutes per day, commuting, occupational tasks, or household activities, as well as purposeful health-enhancing movements/activities (Diaz & Shimbo, 2013). Physical activity was divided into the following three types;

2.1.1 Leisure-time physical activity referred to activities that one participates in during their free time that results in substantial energy expenditure. These activities include structured exercise as well as walking, hiking, gardening, sport, and dance (Howley, 2001).

2.1.2 Occupational physical activity referred to activities that are associated with the performance of a job that might include walking, pulling, lifting, pushing, carpentry, gardening, and packing boxes (Howley, 2001).

2.1.3 Sedentary behavior referred to activities that did not increase energy expenditure above the resting level and has been operationally defined as activities with energy expenditure ≤ 1.5 METs while in a sitting or reclined posture (ie., sleeping, watching television, video, gaming, computer use) (Pate, O'Neill, & Lobelo, 2008).

According to previous researches in hypertension patients, the results presented that the patient should perform 30 minutes to 60 minutes of moderate intensity dynamic exercise (such as walking, jogging, cycling or swimming) about four to seven days per week (Rigsby, 2011), or 180 minutes per week of moderate-intensity physical activity (Elmer et al., 2006). In addition, Gee et al. (2012) stated that controlled blood pressure was also related to a certain amount of moderate- to vigorous-intensity physical activity per week. Roy (2002) suggested that moderate intensity activity (40-75 percent of the maximum oxygen uptake) effective in lowering blood pressure.

Hypertension patients should exercise five to six times per week depending on their initial fitness level and endurance activities such as walking, swimming, and cycling and low-impact aerobics should be the core of the exercise

program. The total exercise duration should be in the range of 30 minutes to 60 minutes per session. People with lower levels of fitness should start with shorter durations (10 to 15 minutes) and gradually   (5 minute increments every 2 to 4 weeks) increase to the 30- to 60- minute goal.

Following the guidelines of hypertension treatment, patients should engage in regular physical aerobic activity such as brisk walking for at least 30 minutes per day or most days of the week (Chobanian et al., 2003; Thai Hypertension Society, 2012), as a result, systolic blood pressure can be reduced by 4-9 mmHg. According to the 2013 American Heart Association Guideline, adults should perform aerobic physical activity for reducing blood pressure approximately 3 to 4 sessions a week, lasting on average 40 minutes per session, and should involve moderate-to-vigorous intensity physical activity (Eckel, 2013).

All overweight hypertensive patients should be advised to lose weight (Aucott et al., 2009). Height, weight and waist circumference should be measured, and body mass index (BMI) calculated in all adults. Maintenance of a healthy body weight (BMI of 18.5 kg/m^2 to 24.9 kg/m^2; waist circumference of less than 102 cm for men and less than 88 cm for women) is recommended for non-hypertensive individuals to prevent hypertension and for hypertensive patients to reduce blood pressure levels (Chobanian et al., 2003; Khan et al., 2009). It was recommended for patients with hypertension by reducing systolic blood pressure 5-20 mmHg per 10kgs of excess weight lost. For Thai adults with hypertension, the Thai Hypertension Society (2012) recommends that Thai patients should maintain a body mass index of between 18.5 kg/m^2 to 23 kg/m^2 and a waist circumference of less than 90 cm for men and less than 80 cm for women.

2.2 Dietary consumption

An eating behavior which is low in saturated fat, cholesterol, and total fat and emphasizes fruits, vegetables, and fat-free or low-fat milk and milk products, and a low salt diet for reducing or maintaining blood pressure levels, following the DASH eating plan. It was recommended that hypertensive patients and normotensive individuals at increased risk of developing hypertension consume a diet that emphasizes fruit, vegetables and low-fat dairy products, dietary and soluble fiber, whole grains and proteins from plant sources, and a diet that is reduced in saturated fats and cholesterol. Rigsby (2011) suggested that increasing the consumption of fruit and vegetables could decrease blood pressure levels. A diet that was rich in fruit, vegetables, whole grains and low-fat dairy foods has been shown to lower systolic blood pressure (SBP) by 6–14 mmHg (Bertoni, Foy, Hunter, Quandt, Vitolins, & Whitt-Glover, 2011). Elmer et al. (2006) mentioned that the goals for controlling hypertension consist of increased consumption of fruit and vegetables (9 to 12 servings/d) and low-fat dairy products (2 to 3 servings/d) and reduced consumption of saturated fat ($\leq$ 7% of energy) and total fat ($\leq$ 25% of energy).

Potassium-rich food helps to reduce blood pressure levels. The WHO (2013) recommended that adults should consume at least 3,510 mg of potassium /day. Potassium-rich foods include: beans and peas (approximately 1,300 mg of potassium per 100 g), nuts (approximately 600 mg/100 g), vegetables such as spinach, cabbage and parsley (approximately 550 mg/100 g) and fruit such as bananas, papayas and dates (approximately 300 mg/100 g). For Thai people, the Ministry of Public Health (2012; Thai Hypertension Society, 2012) suggested that dietary potassium intake should be 7,500 mg per day in hypertensive patients.

In regards to dietary behavior, the guidelines of hypertension treatment (Chobanian et al., 2003; Thai Hypertension Society, 2012) suggested that patients should follow the Dietary Approaches to Stop Hypertension [DASH] eating plan which helps them to reduce their blood pressure levels by 8-14 mmHg. The Dietary Approaches to Stop Hypertension [DASH] eating plan was an eating plan which is low in saturated fat, cholesterol, and total fat and emphasizes fruit, vegetables, and fat-free or low-fat milk and milk products for reducing blood pressure (U.S. Department of Health and Human Services, 2006; "What is the DASH diet?.", n.d.).

According to the U.S. Department of Health and Human Services (2006), the goals of the DASH Eating Plan consisted of a total fat consumption of less than 27% of total calories, saturated fat should be less than 6% of calories, dietary cholesterol should be less than 150 mg, protein is 18% of total calories, carbohydrate is 55% of calories, high fiber should be more than 30 g, sodium should be less than 2,300 mg, potassium should be more than 4,700 mg, magnesium should be more than 500 mg, and calcium is 590 mg per 1,000 calories.

To prevent hypertension, Khan et al. (2007) and Elmer et al. (2006) recommend that dietary sodium intake should be less than 100 mmol (2,300 mg) per day. In hypertensive patients, dietary sodium intake should be limited to 65 mmol to 100 mmol (1,495 mg to 2300 mg or 2.4 g sodium or 6 g sodium chloride) per day, as a result, systolic blood pressure would be reduced by 2-8 mmHg (Chobanian et al., 2003; Thai Hypertension Society, 2012). A dietary sodium intake of 1,500 mg (65 mmol) per day was recommended for adults aged $\leq$ 50 years; 1,300 mg (57 mmol) per day for age 51-70 years; and 1200 mg (52 mmol) per day for age > 70 years.

Furthermore, WHO (2013) recommended that adults should consume less than 2,000 milligrams of sodium, or 5 g of salt per day. Sodium content was high in processed foods, such as bread (approximately 250 mg/100 g), processed meats like bacon (approximately 1,500 mg/100 g), snack foods such as pretzels, cheese puffs and popcorn (approximately 1,500 mg/100 g), as well as in condiments such as soy sauce (approximately 7,000 mg/100 g), and bouillon or stock cubes (approximately 20,000 mg/100 g). For Thai people, the Ministry of Public Health (2012; Thai Hypertension Society, 2012) suggested that a dietary sodium intake should not be more than 2,000 mg per day (1 teaspoon for salt and 3 teaspoons for fish sauce) and patients should avoid sodium from food products such as fish sauce, shrimp paste, fermented bean paste, monosodium glutamate, sausages, seafood salting, and snacks.

2.3 Avoiding risks behaviors

It was defined as avoiding behaviors which would raise blood pressure level such as smoking cigarettes or cigars, caffeine consumptions, and activities that increase high blood pressure level such as stretching, cough, or lifting. Also, in order to reduce blood pressure, alcohol consumption should be recommended. The limitation of alcohol to no more than 2 drinks per day for most men and to no more than 1 drink per day for women in a reduction of 2-4 mmHg of blood pressure levels (Chobanian et al., 2003; the Thai Hypertension Society, 2012).

2.4 Stress management

In hypertensive patients in whom stress may be contributing to blood pressure elevation, stress management should be considered as an intervention. Individualized cognitive behavioral interventions were more likely to be effective when relaxation techniques are used (Khan et al., 2007). According to Campbell,

Labelle, Bacon, Faris, and Carlson (2012) who studied about the impact in the Mindfulness-Based Stress Reduction (MBSR) program on blood pressure, the result showed that "Higher BP" participants in the MBSR group (n = 19) had lower systolic blood pressure at week 8.

Consequently, Ejindu (2007) found that a 20 minutes foot massage and a 20 minutes facial massage using peach-kernel base oil reduced systolic blood pressure by 8.5 mmHg which was recorded immediately after the facial massage compared to that of 1 mmHg recorded after the foot massage. Both mental relaxation, thinking pleasant thoughts for 10 minutes, and slow breathing which maintain the respiratory rate at 6 breaths/min performed over 5 seconds, could decrease systolic blood pressure and diastolic blood pressure (Kaushik, Kaushik, Mahajan, & Rajesh, 2006).

2.5 Seeking follow-up

The JNC-7 (Chobanian et al., 2003) suggested that most patients should follow-up at least monthly intervals or less until the BP-goal is reached. After BP is at goal and stable, follow-up visits could usually be at 3 to 6 month intervals.

3. Existing measurements of LMB in adults with hypertension

Based on the literature review, there were a few published lifestyle modification behaviors instruments which measure the totality of necessary behaviors for BP control. Four published instruments were found in other countries and Thailand. The instruments were described and the psychometric data was summarized as follows.

3.1 The Blood Pressure Self-Care Scale was developed by Peters and Templin (2008) for measuring all behaviors which are recommended for BP control in

African Americans adults. The conceptual framework used for the development of this scale was the self-care deficit nursing theory (SCDNT) and the JNC-7 guidelines. These scales included diet, weight control, physical activity, alcohol and tobacco use, stress reduction, perceived need for physician care, and the use of medications to control blood pressure. The final 8 items assessed the frequency of all self-care practice which is recommended for BP control. Each was created using a 7-point and bipolar format. Items on this scale responded from 'never' (1 score) to 'always' (7 scores). Total scores were determined as the average of the scores on each item. A total score near 7 indicated high consistency engagement in blood pressure self-care practices. Confirmatory factor analysis (CFA) was conducted on the scale to assess the relationship of test items to the underlying constructs being evaluated. The fit of this bi-factor model was acceptable. Internal consistency reliability for this scale was .71 of Cronbach's alpha coefficient.

3.2 The Hypertension Self-Care Activity Level Effects (H-SCALE) was created by Warren-Findlow and Seymour (2011) based on previous instruments and the JNC-7 guidelines. The scale consisted of medication adherence, weight control, physical activity, smoking, alcohol intake, and the DASH eating plan. Medication adherence had 3 items capturing the number of days in the past week (0 through 7). The practice of weight management activities was assessed with 10 items related to dietary practices such as cutting portion sizes and food substitutions as well as exercising specifically to lose weight. Activities were assessed based on recall during the past 30 days. Response options used a 5-point Likert scale from strongly disagree (1 score) to strongly agree (5 scores). Physical activity was assessed by 2 items and the response options for both items were 0 to 7 days. Smoking exposure

was assessed by 2 items and the response options for both items were 0 to 7 days. Alcohol intake was assessed using an existing measure in 3-items. Twelve items assessed practices related to avoiding salt while cooking and eating, avoiding foods high in salt content, avoiding fatty or fried foods, and eating the recommended servings of fruit and vegetables, which was similar to the DASH diet. Response options ranged from 0 to7 days.

The internal consistency of items for each subscale was examined using a Cronbach's alpha coefficient. Fit statistics were calculated for each activity measure in order to test how well the hypothesized group of items performed as a measure of the activity domain; values of greater than .95 are considered to be acceptable and an indicator of fit to the model. All self-care domains were accepted to good internal consistency, indicating that the scale was consistent and reproducible: medication (.84), low-salt diet (.74), weight management (.87), and alcohol use (.88). The fit statistic values are acceptable because they were above .95.

3.3 The Adherence to Lifestyle Modifications Questionnaire (ALMQ)

was developed by Limcharoen (2006). The researcher modified this questionnaire from the Hypertension Self-care Practice Scale by Panpakdee et al. (1999 cited in Limcharoen, 2006). The questionnaire asked about frequency of self-care practices including dietary consumption, physical activity, avoiding risk factors, stress management, and follow up. The questionnaire consisted of 21 items and it was measured on an 11-point Likert's scale with response from 'never' (0 score) to 'always' (10 scores). A total score was obtained by summing the response values across all items, and the score ranged from 0-210. Higher scores indicated higher adherence to lifestyle modification. The researcher tested the instruments with 248

hypertensive adult patients at the outpatient clinic in Thailand and the instrument's internal consistency reliability was .81. Good psychometric properties and fit with Thai hypertensive population were the strength of this instrument; however, the researcher did not mention about duration of lifestyle modification behaviors.

3.4 The Hypertensive Adherence to Therapeutic Regimens Scale (HATRS) was developed by Pinprapapan et al. (2013) and modified from the Adherence to Lifestyle Modifications Questionnaire by Limcharoen (2006). The scale consisted of 29 items which included dietary modifications, weight control, smoking cessation, physical activity, alcohol consumption, stress management, medication taking and four attributes of adherence were added. Each item had possible responses ranging from 1 (not true) to 4 (strongly true). A total score was obtained by summing the response values across all items, with a score ranging from 29-116. Higher scores indicated higher adherence to a therapeutic regimen. The instrument's internal consistency reliability was .92. Although high reliability of the instrument and fit with Thai hypertensive population were found, there was a difference of concept which guided for develop this instrument from this study.

To conclude, lifestyle modification behaviors were defined as an action for changing behavior which was recommended for blood pressure control following the JNC-7 guidelines of physical activity, weight reduction, dietary behavior, sodium reduction, follow up and stress management. In this study, lifestyle modification behaviors were measured by the Lifestyle Modification Behaviors Questionnaire (LMBQ) which was modified from the Adherence to Lifestyle Modifications Questionnaire (Limcharoen, 2006). The ALMQ was a suitable instrument to measure lifestyle modification behavior in the proposed model because this scale was

developed based on nursing theory and covers all behaviors following the JNC-7 guidelines. The researcher had a clear framework to develop this questionnaire. The psychometric properties were tested in Thais adults with hypertension, which was the same as the population in this study. The internal consistency reliability for this scale was accepted. However, the instrument needed to modify before using to measure LMB, because the original questionnaire was developed base on the JNC-7 guideline. For improving, the content following the JNC-8 guideline needed to consider and add in this instrument.

4. Factors influencing LMB in adults with hypertension

When seeking to understand what the lifestyle modification behaviors are, it became evident that lifestyle modification behaviors were a key concept to prevent and control blood pressure levels. The success of lifestyle behavior modifications depended on several factors. The literature review was carried out by using the research database and restricted to (1) measure or self-report on lifestyle modification behavior; (2) adults with hypertension; (3) full-text articles published from 2005 to 2014; and (4) articles written in English and Thai language. If a publication was about hypertension screening, diagnosis or pharmacological treatment, it was excluded from the literature review.

The results of the literature review found that there were many modifiable and non-modifiable factors influencing lifestyle modification behaviors in adults with hypertension. Most of the influencing factors could predict lifestyle modification behaviors from a low to moderate level and both direct effects were found. Some influencing factors in several previous studies such as attitude, desire, and self-efficacy derived from theory such as the health belief model, Theory of Planned

Behavior, or the Model of Goal–Directed Behavior. These theories consisted of many factors or components to explain about a given behavior.

Moreover, several previous studies were published in Europe, the USA or other countries, including Thailand. However, some influencing factors such as social support were examined in Thai studies more than studies in other countries, because the Thai family was brought up to have close family ties and to respect older persons. Therefore, when family members were ill, other members would seek help and care for them to get well. According to the literature review, all influencing factors of lifestyle modification behaviors in adults with hypertension were derived from relating theories and previous studies. These factors were divided into three groups: personal, psychological, and social factors.

4.1 Personal factors referred to natural agents that lead to the inheritance of specific traits within organisms, personal status, or personal characteristics. From previous studies, the major personal factors were age, gender income, education and personal habits (Gee et al., 2012; Han, Kim, Kang, Jeong, Kim, & Kim, 2007; Lee et al., 2010). Heymann et al. (2011) found that hypertensive patients in Israel aged over 60 years predicted high scores on healthy lifestyle behaviors (including physical activity and diet for hypertension) (OR 0.62, $p < .05$). Moreover, Tantayotin (2004) found that gender and marital status had a negative effect on nutrition behavior among hypertensive patients in Nonthaburi Province, Thailand ($\beta = -.14, -.18, p<.05$). Also, Lee et al. (2010) found that age and duration of illness had a positive influence on hypertension self-care behaviors (including medication taking, healthy diet, weight control, and exercise) in middle-aged adult Korean Americans with hypertension ($\beta =.16, .18, p<.001$). Most personal factors

could predict lifestyle modification behaviors in adults with hypertension at a low level ($\beta > .50$), and only one factor such as age could predict the behavior at a moderate level ($\beta = .56$).

   4.2 Psychological factors were defined as events of or relating to or determined by mental functions and are divided into two categories; cognitive factors and affective factors. Cognitive factors referred to mental activities that involved information processing (such as beliefs, perceptions, or knowledge), whereas affective factors were represented by individuals' emotions or feelings which was a part of their decision-making and behavior processes that include attention, interpersonal relationships, emotions, and motivation levels.

   From the literature review, psychological factors included intention, desire, motivation, attitude, and illness identity (Baghianimoghadam et al., 2011; Chen et al., 2009; Chen et al., 2011; Corne´ lio et al., 2012; Middleton, 2009; Peters & Templin, 2010; Ross, Walker, & MacLeod, 2004; Sukprungprom, 2008; Taylor et al., 2005). For example, Baghianimoghadam et al. (2011) found that factors which predicted trying for the self-regulation of blood pressure in 200 hypertensive patients aged 30 years and older were perceived behavior control ($\beta = .33$, $p<.05$), and intention ($\beta = .33$, $p<.05$) and accounted for 52% of the variance in trying for self-regulation of blood pressure. Moreover, illness identity also had a negative and direct effect on adherence to self-management (i.e., dietary pattern, exercise behavior, appointment keeping) in adults with hypertension ($\beta = -.30$, $p<.05$) (Chen et al., 2009; Chen et al., 2011).

   4.3 Social factors were defined as influences on individual behavior attributable to the social values. The previous studies found that the social factors

predicted lifestyle modification behaviors in adults with hypertension such as social norms (β = .29, r = .22 – .38, p < .05) (Corne′ lio et al., 2012; Middleton, 2009; Peters & Templin, 2010; Taylor et al., 2005), patient-clinician communication behavior, getting encouragement from health personnel, social support to goal-setting in the family, spouse, friends and health personnel (β = .13 - .46, p < .05) (Pinprapapan et al., 2013; Sukprungprom, 2008).

Moreover, a qualitative study about the management of hypertension found that little knowledge, limited patient-clinician communication regarding goals, plans, and feedback related to blood pressure control (Brown et al., 2007). Sukprungprom (2008) found that getting encouraging from members of one's family, relatives, and close friends and getting encouraging from medical and health personnel affect health promoting behaviors in patients with hypertension, Amphawa District, Samut Songkhram Province, Thailand (β = .46 and .56, p < .01). According to several previous studies, social factors influenced lifestyle modification behaviors in Thai adults with hypertension more than other studies, especially in regards to social support. Therefore, social support is a strong predictor to the behaviors in Thai people.

In brief, there were many factors including personal, psychological, and social factors that could predict lifestyle modification behaviors in adults with hypertension (Figure 2). Although personal factor were related to control blood pressure level in adults with hypertension, some factors such as age and gender were non-modifiable factors. Psychological factors could enhance an individual's readiness for change which was important for the success of blood pressure control in the long term. In addition, social factor such as social support helped individuals change their behavior

by having support to increase the individual's ability to regulate behavior to achieve the goals. Thus, both types of factors such as psychological and social factors would be examined in this study.
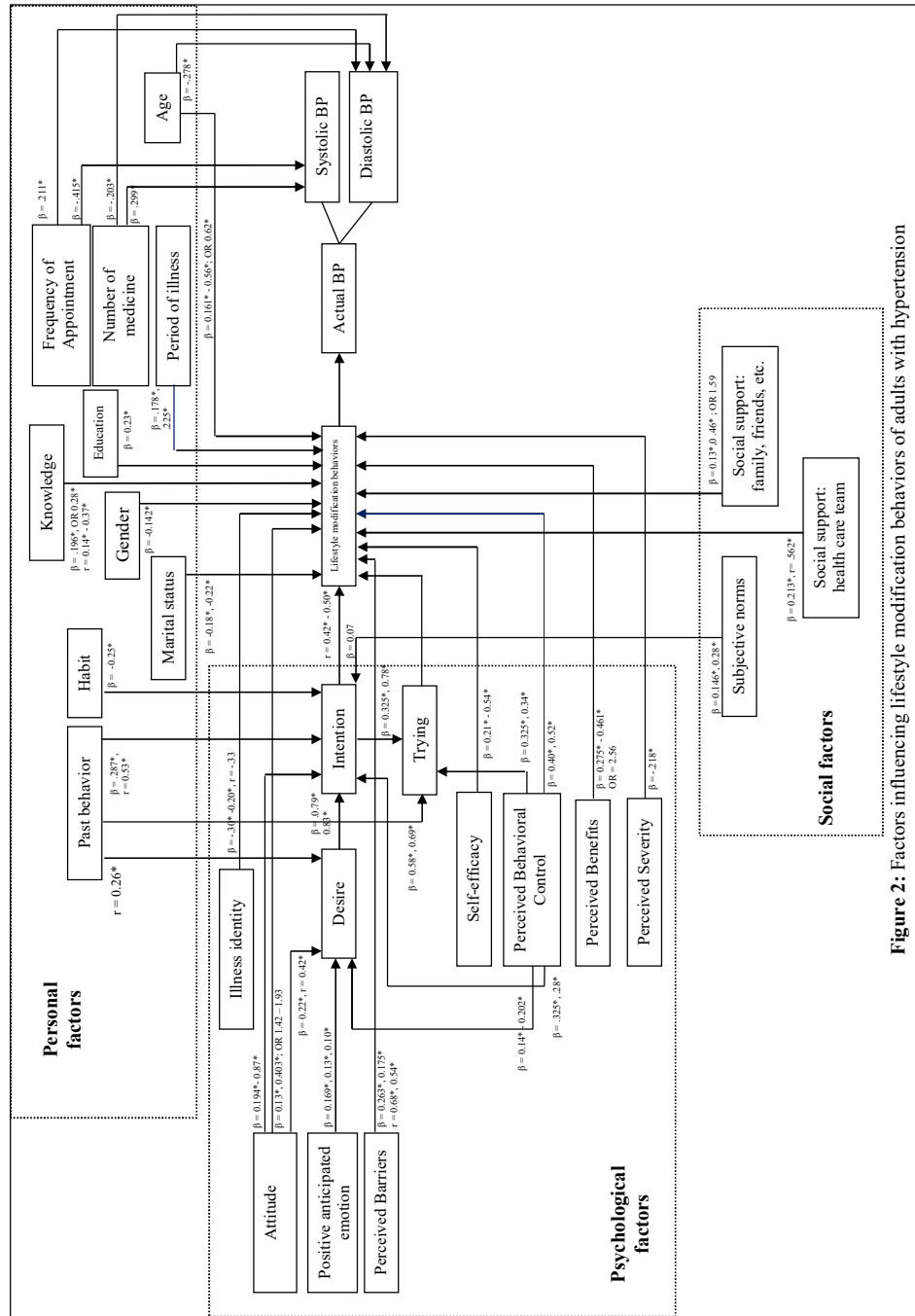
Figure 2: Factors influencing lifestyle modification behaviors of adults with hypertension

Based on previous studies both in Thailand and other countries, there were 13 influencing factors which were modifiable factors including psychological and social factors. Firstly, **social support** (both family support and healthcare provider support) was predictive of lifestyle modification behaviors in adults with hypertension in several studies, particularly in Thailand, and received quite low to moderate level (β = .13 – .46, OR = 1.59). The results of previous studies indicated that **illness identity** negatively predicted behavior and was at a low level in hypertensive adults (β = .20 – .30); however, this variable was used in a few studies on hypertension both in Thailand and other countries.

In addition, perceived self-efficacy, benefits, and barriers, which were variables in the Health Promotion Model, were empirically supported as predictors of lifestyle modification behaviors in adults with hypertension (i.e. eating behavior, exercise behavior, weight control). **Self-efficacy** and **perceived benefits** provided moderate to high support (β = .35 – .54, r = .80 – .81 and β = .25 – .46, OR 2.56 respectively), with **perceived barriers** receiving low support (β = .14 – .26). Similarly, **perceived severity** could predict specific behavior such as eating behaviors (β = -.22). Whereas, **trying** predicted high scores on weight control behavior in adults with hypertension (OR=1.11).

Furthermore, attitude, subjective norms, anticipated emotions, perceived behavioral control, desire, and intention were variables in the Model of Goal-Directed Behavior which evolved from the Theory of Planned Behavior. **Attitude** contributed to the explanation of lifestyle modification behaviors in adults with hypertension in a majority of the studies and was a strong significant predictor (β = .13 – .87, OR = 1.42 – 1.93). **Perceived behavioral control** was a moderate significant predictor (β =

.14 – .52) and affected lifestyle modification behaviors in several previous studies. **Desire** and **intention** were a strong and significant indirect predictor of the target behavior in all studies (β = .30 – .83 and β = .33 – .78 respectively). On the other hand, **subjective norms** and **anticipated emotions** had a low significant indirect effect on lifestyle modification behaviors (β = .29 and β = .10 - .13, respectively) and failed to explain the behavior in a number of the studies. Thus, 13 variables were considered as useful predictors to the proposed model (Figure 3).
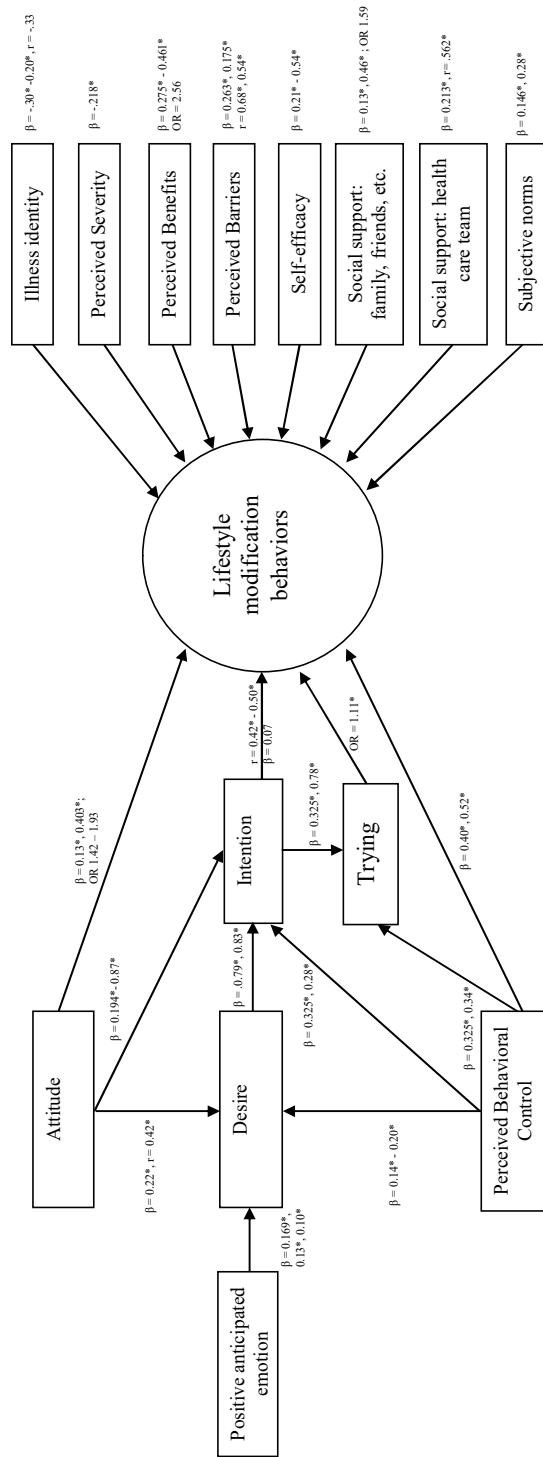
Figure 3: Psychological and social factors influencing lifestyle modification behaviors among adults with hypertension

In the proposed model, the selected variables have to be modifiable factors which can be improved and changed by adults with hypertension and nurses. The 13 selected variables were social support, illness identity, self-efficacy, perceived benefits, perceived barriers, perceived severity, trying, attitude, perceived behavioral control, desire, intention, subjective norms, and anticipated emotions. The criteria for selecting the explanatory variables for the proposed model in this study were (1) the variable should have a β more than .50 (Polit, 1996) or odds ratio more than 1.00 (Davies et al., 1998), (2) If β was between .30 and .50, the variable must be a significant predictor at least three studies or be a Thai context variable which was a significant predictor in several studies in Thailand, and (3) psychosocial factors influencing lifestyle modification behaviors would be concern in this study. Thus, following this criteria, 8 variables were selected for the proposed model. All selected variables in this study consisted of attitude, perceived behavioral control, desire, intention, social support, self-efficacy, illness identity, and trying to adopt lifestyle modification behaviors in Thai adults with hypertension (as shown in Figure 1).

1) Attitude: attitude was a strong significant predictor in a majority of the previous studies. Attitude had a direct and indirect influence on lifestyle modification behaviors among adults with hypertension. For example, Peters and Templin (2010) found that attitude toward blood pressure control had an indirect influence on blood pressure self-care behaviors (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) via intention (β = .87, p < .05). Corne´ lio et al. (2012) found that attitude toward salt consumption had a direct and indirect influence on salt consumption behavior through intention (OR = 1.42 and β = .31, p < .05,

respectively). Similarly, Baiya (2011) has indicated that attitude had an influence on health behaviors (including dietary behavior, taking medicine behavior, seeking follow up, exercise behavior and stress management) in adults with hypertension ($\beta = .43$, $r = .52$, $p < .05$).

2) *Perceived behavioral control:* perceived behavioral control was found to be a moderate significant predictor and can directly and indirectly affect lifestyle modification behaviors in previous studies. For example, Peters and Templin (2010) found that perceived behavioral control had predicted blood pressure self-care (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) in 306 African Americans adults with HTN ($\beta = .40$, $p < .05$). Similarly, Chen et al. (2011) found that the effect of control on self-management (healthy diet and exercise behavior) was statistically ($\beta = .52$, $p < .05$) in hypertensive patients in Taiwan.

3) *Desire:* desire was a significant indirect predictor of the target behavior in two previous studies. These previous studies discovered that desire had a positive relationship and positive direct influence on the intention for self - regulation of blood pressure. Taylor et al. (2005) found that desire affected intentions for the self-regulation of hypertension among patients with hypertension ($\beta = .79$, $p < .01$ for men, $\beta = .83$, $p < .05$ for women). Also, Baghianimoghadam et al. (2011) found that desire affected directly on intention for hypertension ($\beta = .30$, $p < .05$).

4) *Intention:* Three prior studies found that intention correlated with behaviors among adults with hypertension and explained the positive influences on behavior. For example, Taylor et al. (2005) found that intentions had a significant direct effect on trying to self-regulate hypertension among patients with hypertension

(β = .78, p < .05 for men). Similarly, Baghianimoghadam et al. (2011) found that intention had a positive and direct influence on trying to self-regulate hypertension (β = .33, p < .05). Peters and Templin (2010) found that intention related to blood pressure self-care behaviors (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) in 306 African Americans adults with HTN (r = 0.42, p < .05).

5) *Trying:* From the review of the literature, there were previous studies that predicted trying for self-regulation in adults with hypertension. For instance, Taylor et al. (2005) found that perceived behavioral control and past behavior explained the variances in trying to self-regulate hypertension at 56% in men and 50% in women. None of the research studied the relationship between trying and lifestyle modification behavior in hypertension; however, based on the MGB, trying played a key process intervening between intentions and behavior (Taylor et al., 2005). Thus, trying was proposed in the previous model as a dependent variable. Trying was tested in several related studies. For example, Zhao et al. (2009) found that trying to lose weight predicted high scores on weight control behaviors among overweight adults with hypertension in the US (OR=1.11, 95% [CI]: 1.05–1.17). Andreyeva et al. (2010) found that trying to lose weight could predict high scores on engaging in physical activity in adults with obesity (β = .70, p < .05). However, in these previous studies the concept of trying was different even though the populations under study were similar.

6) *Social support:* Social support was related to and influenced behaviors in adults with hypertension in several studies, particularly in Thailand. Thus, this variable was selected because it was a Thai context variable. For example,

about five previous studies in Thailand found that social support was significantly related to and predicted lifestyle behaviors in Thai hypertensive patients (Baiya, 2011; Peamnoom, 2007; Pinprapapan et al., 2013; Kebwai, 2006; and Sukprungprom, 2008). Social support appeared to be an important determinant of success in motivation for changing and maintaining a behavior which was recommend for blood pressure control.

7) Self-efficacy: Self-efficacy was empirically supported as predictors of behaviors in adults with hypertension in Thai studies and others. For example, Pinprapapan et al. (2013) found that self-efficacy as having a positive direct effect on adherence to therapeutic regimens (i.e., lifestyle modification and medical adherence) among adults with hypertension in Northern Thailand ($\beta = .54$, $p < .01$). Also, Warren-Findlow et al. (2012) studied the association between self-efficacy and hypertension self-care activities (including medication adherence, low salt diet, physical activity, weight management, and alcohol and smoking intake) among African Americans adults with hypertension. They found that good self-efficacy increased the percentage of adults adhering to a low salt diet and engaging in physical activity, with 64% and 27%, respectively (low salt diet: PR = 1.64, 95% CI: 1.07–2.20; physical activity: PR = 1.27, 95% CI: 1.08–1.39).

8) Illness identity: The last variable was illness identity. Although the β of illness identity was less than .50, the results of three previous studies indicated that illness identity was related to and predicted negatively blood pressure control in adults with hypertension. There was little knowledge about this variable within the Thai people. One study in Thailand found that illness identity was negatively related to medication taking behavior in women with hypertension ($r = -.33$, $p < .01$)

(Leelacharas, 2005). In other countries, Chen et al. (2011) found that the indirect influence from illness identity to adherence to self-management (including healthy diet, unhealthy diet, and exercise regimen) was -.30 ($p < .05$) among patients with HTN. Also, Chen et al. (2009) revealed that illness identity had an indirect influence on adherence to self-management (including healthy diet, unhealthy diet, exercise regimen, and appointment keeping) in Taiwanese patients with hypertension ($\beta = -.30$, $p < .05$).

Explanatory Variables Related to Lifestyle Modification Behaviors (LMB)

    1. **Variables based on Model of Goal Directed Behavior**

        Model of Goal Directed Behavior (MGB)

The Model of Goal Directed Behavior (MGB) was developed by Perugini and Bagozzi (2001) and expanded from the Theory of Planned Behavior (TPB) (Ajzen, 1991). They argued that TPB focused on the action as the target, while the Model of Goal-Directed Behavior (MGB) focused on the desire to directly perform the behavior through intention. Bagozzi and Edwards (1998) mentioned that TPB did not take directly into account the emotional consequences of both achieving and not achieving a sought after goal.

Perugini and Bagozzi (2001) developed the MGB to apply for decision-making where behaviors are performed with the manifest purpose to reach a specific goal. They believed that MGB has been shown to play an important role in decision making to achieve a goal. The purpose of MGB was to focus decision making behavior prior to intention formation, thus the variable of behavioral desire is presented (Shiu, Hassan, Thompson, & Shaw, 2008). Based on the MGB, there was a

need to view goals such as actions, and to consider dynamic factors such as counterfactual thinking and feedback from anticipated consequences of goal attainment and goal failure.

The components of Model of Goal Directed Behavior (MGB) included attitude, subjective norms, and perceived behavioral control to predict intention, and intention along with perceived behavioral control predicts actual behavior.

Attitude

Attitude is conceptualized as a multidimensional construct consisting of cognition, affect, and conation (Ajzen, 1988). The cognition portion reflects a person's information about and perceptions of a particular attitude object, affective responses have to do with the feelings toward the object, and cognitive responses are concerned with behavioral inclination and commitment. Attitude reflects a person's belief regarding the behavior combined with the value the person places on the outcome of performing the behavior (Peters & Templin, 2010). Mainly, attitude is the degree to which the performance of the behavior is positively or negatively valued. For example, a patient with hypertension who believes that canned food is unhealthy, because he/she tends to reduce salt consumption.

Subjective norm

Subjective norm refers to the perceived social pressure to perform or not perform the behavior, which is a person's perception of the social expectations to adopt a particular behavior. Subjective norm is influenced by a person's normative beliefs combined with the person's motivation to comply. Normative beliefs are concerned with the likelihood that important others would approve or disapprove of a

behavior, and motivation to comply is an assessment of how important it is to have approval of important others (Ajzen, 1991).

Perceived behavioral control (PBC)

PBC refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediment and obstacles (Ajzen, 1991). PBC was used to explain attempting to deal some situations which people lack of complete volitional control over the behavior of interest (Ajzen, 2002). Some behaviors may meet the requirement; the performance of most depends at least to some degree on such non-motivational factors as the availability of requisite opportunities and resources (e.g. time, money, skills, and cooperation of others). A person has the required opportunities and resources, and intends to perform the behavior, so he or she should succeed in doing so.

Based on TPB, the salient beliefs underlying the formation of this concept are control beliefs, which involve the person's perceptions of resources versus barriers for engaging in the behavior. These beliefs are combined with the perceived power of each control factor to facilitate/impede the behavior to form the overall perceived behavioral control. Perceived behavioral control can be used directly to predict behavioral achievement. Intention is likely to increase with perceived behavioral control, on the other hand, a direct link between perceived behavioral control and behavior achievement that is perceived behavioral control can be used as a substitute for a measure of actual control.

Anticipated emotions

Anticipated emotions are a function as important antecedents in decision-making processes (Perugini & Bagozzi, 2001), or a function dynamically in

a self-regulatory sense in response to actual or imagined feedback (Taylor et al., 2005). Anticipated emotions specify that the referents of anticipated emotions are personal goals. Anticipated emotions function as independent variables based upon a decision process that takes into account judged consequences of goal achievement and goal failure, and anticipated emotions are measured as unipolar reactions.

Past behavior

Past behavior is a predictor of desires, intention, and behavior. Past behavior serves as a control for unmeasured determinants of behavior that may have been stable over time in their effects, and may reflect habitual processes (Taylor et al., 2005). For the frequency of past behavior, there are two processes through which frequency of past behavior guides future behavior. When a behavior is well-practiced in a constant environment, the frequency of the past behavior reflects habit strength and has therefore a direct effect on future behavior. However, when behaviors are not well-learned or when they are performed in unstable contexts, frequency or past behavior conducts directly to intention (Perugini & Bagozzi, 2001). Recency of behavior performance should influence future behavior to the degree that availability and anchoring/adjustment biases occur in information processing and to the degree that an activity, whether instituted or not, has been recently initiated. Consequently, recency may serve as an indirect indicator that an intention has been activated and therefore be positively associated with subsequent performance of the behavior.
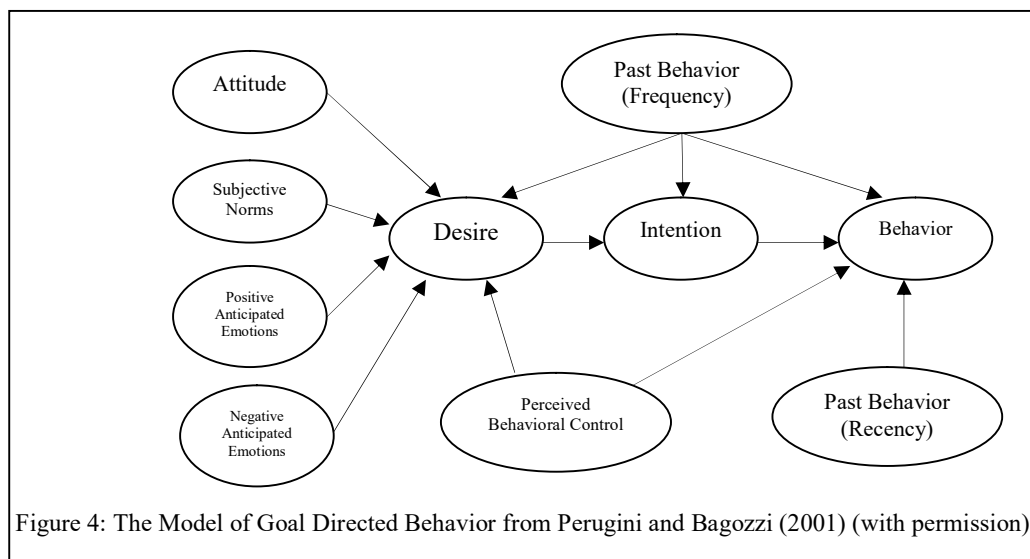
Desire

Desire represents the motivational state of mind wherein appraisals and reasons to act are transformed into motivation to do so. Perugini and Bagozzi (2001) proposed that desire provides the motivational impetus for intentions, that is, one is

aware of and accepts his or her desire to act, and this will motivate him or her to form an intention. Desires serve as essential mediators between attitude, subjective norms, anticipated emotions, and perceived behavioral control, that is a reason for acting that a decision maker takes into account to form a self-commitment to act (Taylor et al., 2005). In the MGB, the target behavior is instrumental to goal achievement. Therefore, the specification of desire is relative to the performance of a given behavior (e.g. lifestyle modification behavior) because it is conductive to goal attainment (blood pressure regulation). Desires perform two roles. The first is a transformative one and overcomes the lack of direct emotive content frequently present in reasons for acting. A second role for desires is an integrative one wherein the different, and potentially competing, reasons for acting are solved into a self-conclusion that one desires to act or not.

Intentions

Intentions are assumed to capture the motivational factors that influence a behavior, they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior (Ajzen, 1991). Besides influencing intentions, perceived behavioral control can directly affect behavior, particularly in situations where behavior is not under total volitional control. Thus, intention represents a person's motivation to perform the behavior (Corne´ lio et al., 2012) which Perugini and Conner (2000) divided intentions in three functions based on MGB including *1) directive function:* a direct assertion of one's intention, *2) planning function:* a statement of engagement in plans to perform instrument acts in the service of goal pursuit, and *3) volitional function:* an expression of commitment and of effort needed to enact the behavior.

Regarding the relationship between the components, the MGB shows that desires serve as essential mediators and provide the direct impetus for intentions and transform the motivational content to act embedded in attitudes toward the act, anticipated emotion, subjective norms, and perceived behavioral control (where, consistent with the TPB, perceived behavioral control also has direct effects on behavior). Frequency of past behavior is further assumed to be a predictor of desires, intentions and trying; whereas recency of past behavior directly predicts only behavior. The relationship of The Model of Goal Directed Behavior was presented in figure 4.

Figure 4: The Model of Goal Directed Behavior from Perugini and Bagozzi (2001) (with permission)

For this study, the data gleaned from previous studies indicates that attitude, perceived behavioral control, desire, and intention strongly motivates the adult with hypertension to modify his/her behavior. Thus these factors were concerned in this study. The previous studies indicated that subjective norms, past behavior, and anticipated emotion influenced behaviors in adults with hypertension; however, these studies explained these variables to change behaviors in adults with

hypertension inconsistently and insufficiently. Therefore, these variables were excluded from the group of variables to be tested in this study.

These studied variables in the MGB related to behaviors among adults with hypertension in several previous studies. Peters and Templin (2010) found that attitude towards blood pressure control has an indirect influence on blood pressure self-care behaviors (including low fat and salt diet, fruit and vegetable consumption, exercise and weight management, control stress, visit doctor regularly, and avoid tobacco) via intention (β= .98, p<.05). Moreover, Sukprungprom (2008) found that attitude concerning health promotion had an influence on the health promotion for hypertension patients (including health responsibility, nutrition behavior, physical activity, interpersonal relations, spiritual growth, and stress management) (β= .57, p<.05). Perceived behavioral control correlated with relating behaviors for controlling hypertension in adults with HTN (Baghianimoghadam et al., 2011; Corne´ lio et al., 2012; Peters & Templin, 2010). In addition, desire to self - regulate has a positive relationship and positive direct influence on intention for successful self - regulation of blood pressure (Baghianimoghadam et al., 2011; Taylor et al., 2005). Intention was found to correlate most frequently with behaviors among adults with HTN and was explained by having a positive and direct influence on behavior (Baghianimoghadam et al., 2011; Peters & Templin, 2010; Taylor et al., 2005).

Clearly, the management of hypertension requires a certain degree of self-regulation which is defined as the mental and physical processes that a person manages in order to achieve a goal (Taylor et al., 2005). Changes in lifestyle and the adoption of a healthy lifestyle behavior are important to control high blood pressure levels (Chobanian et al., 2003; Hacihasanoglu & Gozum, 2011). Thus, successful

management of hypertension control requires that patients make a commitment to achieving and maintaining control of their blood pressure. According to the humanism perspective used in the MGB to explain how individuals carry out the intention of improving their health, this view is served as a basis for an understanding in hypertensive adult's health motivation as well.

Existing instruments of variables in the MGB

Based on the literature review, there are four publications of existing instruments which were guided by the Model of Goal Directed Behavior. All four existing instruments were developed continuously. (See table 1)

Table 1

Development of Existing Instruments Based on the Model of Goal Directed Behavior

Researchers **MGB Construct**	Perugini and Conner (2000)	Perugini and Bagozzi (2001)	Taylor et al. (2005)	Taylor et al. (2006)
Attitude	11 items	11 items	3 items	3 items
Subjective norms	3 items	3 items	2 items	1 item
PBC	3 items	3 items	3 items	3 items
Desire	3 items	3 items	2 items	2 items
Intention	9 items	3 items	2 items	2 items
Past behavior	1 item	2 items (frequency and recency)	1 item	-
Goal anticipated Emotions (positive and negative emotions)	17 items	11 items	17 items	-
Goal desirability	2 items	-	-	-
Goal feasibility	4 items	-	-	-
Trying	-	-	4 items	4 items

(1) Extended Model of Goal-directed behavior Questionnaire (EMGBQ): Perugini and Conner (2000) developed this instrument to measure achieving goals in two behaviors (weight control and studying effort) among 104 students. It developed based on the Extended Model of Goal-directed behavior (EMGB). The instrument was designed to measure the extent to the goal for which the behaviors are functional. The questionnaire consists of goal anticipated emotions, attitudes, subjective norms, perceived behavioral control, desires, intentions, and past behavior. Furthermore, goal desirability and goal feasibility were extended from the MGB. Goal desires is measured by two items, the first on a 7-point Likert scale from 'false' to 'true', and the second item on a 6-point scale from 'no desire' to 'very strong desire'. Goal perceived feasibility is measured by four items which are two items of goal control and two items of self-efficacy for goals. An 11-point scale corresponds to three items and a 7-point scale corresponds to one item.

In addition, *goal anticipated emotions* are 17 emotions of which 7 are negative emotions and 10 are positive emotions. For the positive anticipated emotions, participants are asked to express the anticipated intensity of each emotion if they succeeded in achieving their goal, whereas negative anticipated emotions asked the participant to express the anticipated intensity of each emotion if they failed in achieving their goal. This is measured on 11-point scale with responses from 'not at all' to 'very much'. *Attitudes for behavior* asked about 'I think that to perform Activity Y in the next 4 weeks to achieve goal X is..' and is measured on a 7-point scale in 11 semantic differential items. *Subjective norms for behavior* are measured on a 7-point scale in three items. *Perceived behavioral control* asked 'How much control do you have over performing Activity Y in the next 4 weeks in order to achieve Goal

X' wand is assessed by an 11-point scale in three items and a 7-point scale in three items also. *Desire for behavior* is measured on an 11-point scale from false to true in two items and a 6-point scale from no desire to very strong desire in one item, for example 'My desire to perform Activity X in the next 4 weeks to try achieve Goal X can be described as..'. *Intentions for behavior* are assessed by a 7-point scale in nine items which consist of intention (two items), commitment (two items), effort (two items), and planning (three items) and asked 'I intend to perform Activity Y in the next 4 weeks in order to achieve Goal X'. *Past behavior* asked about 'How many times did you perform Activity Y during the last year for Goal X' and is measured on a 7-point scale from never to many times in one item.

According to the instrument properties, the confirmatory factor analysis (CFA) was used for demonstrating discriminant validity. The CFA showed a reasonable fit. Discriminant validity was tested by using chi-square difference tests which were highly significant ($p < 0.001$). The loadings were all significant and high. The reliabilities of all constructs were high (.81 – .96).

(2) Model of Goal-directed behavior Questionnaire (MGBQ): Perugini and Bagozzi (2001) developed the instrument for assessment achieving goals in two behaviors (dieting and exercising) among 122 students at the University of Rome. It was developed based on the Model of Goal-directed behavior (MGB). The questionnaire is worded in accordance with selected goals for anticipated emotions, attitudes, subjective norms, perceived behavioral control, desire, intentions and past behavior. *Anticipated emotions* asked participants to express the felt intensity of each emotion expressed in the subjective conditional and are measured on 11-point scale with responses alternating from 'not at all' to 'very much'. *Attitudes* asked about 'I

think that to keep to a diet in order to decrease my body weight during the next 4 weeks is ...' and are measured on 11 semantic differential items on 7-point scale defined by the pairs useless-useful, ineffective-effective, disadvantageous-advantageous, stupid-intelligent, punishing-rewarding, foolish-wise, unpleasant-pleasant, joyless-joyful, boring-exciting, unattractive-attractive, and unenjoyable-enjoyable.

Moreover, *subjective norms* asked about 'List the three most important persons for you and indicate how much each of them would approve or disapprove of you doing physical exercise in order to decrease your body weight during the next 4 weeks' and are measured on a 7-point scale with responses of 'disapprove' and 'approve'. *Perceived behavioral control* assesses how much control over keeping to a diet in order to decrease your body weight during the next 4 weeks' and is measured by three items which follow an 11-point scale in each item such as no control-full control, difficult-easy, and very unlikely-very likely.

Desires are measured by three items which follow an 11-point scale from 'false' to 'true' and asked 'I desire to do physical exercise in the next 4 weeks in order to decrease my body weight during the next 4 weeks'. *Intentions* are measured by three items which follow a 7-point scale in first item from 'very unlikely' to 'very likely' and 'completely disagree' to 'completely agree' in the second and third item. For example, the question 'I am planning to keep to a diet in order to decrease my body weight during the next 4 weeks'. *Past behavior* consists of frequency and recency. Frequency is responded to by a 7-point scale from 'never' to 'very many times' and recency is responded to by a 5-point scale with 'never' to ' always'.

According to the instrument properties, the CFA was used for testing the degree of convergent and discriminant validity. All constructs showed a reasonable degree of convergent validity. Discriminant validity was tested by using chi-square difference tests which were significantly less than 1.00. The reliabilities of the instrument ranged from 0.74 to 0.88.

(3) Model of Goal-directed behavior Questionnaire (MGBQ) Modified Version: Taylor et al. (2005) developed this instrument from previous studies (Ajzen, 1991; Bagozzi & Edwards, 1998; Perugini & Bagozzi, 2001) which were based on the Theory of Planned Behavior (TPB) and the Model of Goal-directed behavior (MGB). This instrument was created for the assessment of self-regulation decisions to control hypertension in 208 patients at a hospital clinic. The MGB questionnaire included anticipated emotions, attitudes, subjective norms, perceived behavioral control, desire, intentions, and past behavior.

Attitude assesses 'considering all the effort and things, I would have to do to reduce (maintain) my blood pressure during the next 4 weeks (for example, exercising, dieting, monitoring my blood pressure, not smoking) and 'my overall attitude toward doing these things makes me feel ..' and is measured by a three 5-point scale with responses from very unpleasant to very pleasant, very bad to very good, and very unhappy to very happy. *Subjective norms* ask about 'please indicate the degree to which most people who are important to you would approve or disapprove of your reducing (maintaining) your current blood pressure sometimes during the next 4 weeks' and are assessed on two 5-point items with responses 'strongly approve' to 'strongly disapprove' and 'definitely should' to 'definitely should not'.

Anticipated emotions asks participants to express the felt intensity of each emotion expressed in the subjunctive conditional and are measured on a 6-point scale in 17 items with responses from 'not at all' to 'very much'. *Perceived behavioral control* assesses about 'Please indicate how much control you have with regard to your blood pressure during the next 4 weeks' and are measured on a 5-point scale in three items by 'no control' to 'total control' in two items and 'very difficult' to 'very easy' in one item. Moreover, *desires* are assessed by two 5-point items that by strongly disagree' to 'strongly agree' and 'no desire' to 'very strong desire'. For example, two of the questions are 'I want to reduce (maintain) my blood pressure during the next 4 weeks' and 'My desire to reduce (maintain) my blood pressure during the next 4 weeks can best be expressed as …'. *Intentions* asked about 'I intend to reduce (maintain) my blood pressure during the next 4 weeks' and are measured on a 5-point scale in two items with responses of very unlike-very likely and strongly disagree-strongly agree. *Past behavior* is assessed in one item about an identical way of trying in the past 4 weeks.

In regards to the instrument properties, the reliability coefficients (Cronbach's alpha) of the constructs were generally quite high (.72 – .94), except for subjective norms and desires which had shown low reliability coefficients (.25 - .28 and .57 - .64, respectively).

(4) Model of Goal-directed behavior Questionnaire (MGBQ) Modified Version 2006: Taylor et al. (2006) developed this instrument from previous studies and it is based on the JNC-6. This instrument was created for the assessment of self-regulation decisions to control hypertension in 196 hypertensive patients at a hospital clinic. Before creating the questionnaire, qualitative research was used for exploring

the differences in means between those who did and those who did not mention their goals. Finally, the MGB questionnaire included attitudes, subjective norms, perceived behavioral control, desire, goal intention, and trying.

Attitude toward success in reducing/ maintaining one's blood pressure assesses 'Assuming I try to reduce (maintain) my blood pressure during the next four weeks and successes, I think that it would make me feel …' and is measured with three 5-point items with responses from unpleasant-pleasant, bad-good, and very unhappy-happy. *Subjective norms* are assessed on a 5-point item with responses of 'definitely should' to 'definitely should not'. *Perceived behavioral control* are measured on a 5-point scale in three items which follow responses of 'no control' to 'total control' in two items and 'very difficult' to 'very easy' in one item. For example, the one question asked 'how much control do you feel you have over trying to reduce (maintain) your blood pressure during the next 4 weeks?'.

Moreover, *desires* is assessed by two items and the first item is a 5-point scale from 'disagree' to 'agree' and the second item uses six responses from 'no desire' to 'very strong desire'. The questions were 'I want to reduce (maintain) my blood pressure during the next four weeks' and 'My desire to reduce (maintain) my blood pressure during the next four weeks can best be expressed as …'. *Goal intentions* ask about 'please express how likely it is that you intend to reduce (maintain) your blood pressure during the next four weeks' and 'please indicate your extent of disagreement and agreement with the following statement: I plan to reduce (maintain) your blood pressure during the next four weeks' and are measured on a 5-point scale in two items with responses of unlikely-likely and disagree- agree. *Trying*

is measured in four items on five-point scales with responses from 'not at all' to 'extremely hard'.

In regards to the instrument properties, CFA was used. Based on the goodness of fit indicators, factor loadings and the correlation matrix of factors, all hypothesized items were judged satisfactory indicators of their respective factors and displayed adequate convergent and discriminant validity. Construct validity was demonstrated for the items yielding 5 factors with 14 indicators, corresponding to attitudes, trying, perceived behavioral control, desire and goal intention. Subjective norm was measured by a single item and was not included in the CFA. The reliability coefficients of the constructs were generally quite high (.79 – .94), and did not include subjective norms.

In conclusion, the four studied variables in the proposed model include desire, attitude, perceived behavioral control, and intention which are based on the Model of Goal-Directed Behavior. These variables would be measured by the Model of Goal-directed behavior Questionnaire (MGBQ) which modified by Taylor et al. (2005). The instrument fit with these variables because the researchers used the Model of Goal-directed behavior (MGB) (Perugini & Bagozzi, 2001) to establish a conceptual framework in their study and reviewed the existing instruments related to the Theory of Planned Behavior (TPB) and the Model of Goal-directed behavior (MGB) (Ajzen, 1991; Bagozzi & Edwards, 1998; Perugini & Bagozzi, 2001) for instrument development in their study. Similarly, the MGB is used to guide as a roadmap of the proposed model. In regards to the instrument properties, this instrument was created for assessing self-regulation decisions to control hypertension,

and was tested in 208 patients at a hospital clinic. Acceptable result presented that the reliability coefficients (Cronbach's alpha) of the constructs were generally quite high.

2. **Empirical variables**

2.1 Self-efficacy

Self-efficacy is based on the Social Cognitive Theory. According to Bandura (1982, 1991 cited in Ajzen, 1991), self-efficacy beliefs can influence choice of activities, preparation for an activity, effort expended during performance, as well as thought patterns and emotional reactions. In addition, self-efficacy is defined as an individual's confidence in his/her ability to perform specific behavior (Bandura, 1997 cited in Pinprapapan et al., 2013). Helping individuals understand that hypertension is a manageable condition can increase their confidence about living with a chronic disease (Warren-Findlow et al., 2012). Two components of self-efficacy consist of self-efficacy expectations which are judgments about personal ability to reach a given behavior, and outcome expectations which are judgments about what will happen if a given behavior is successfully achieved (Resnick, 2013).

In one word, self-efficacy is determined by efficacy expectation which is defined as "the conviction that one can successfully execute the behavior required to produce (certain outcomes)" and, outcome expectation which refers to perception about possibilities that performing behavior will produce outcome (Bandura, 1977 cited in Ajzen, 2002). According to self-efficacy, if a person perceives high efficacy in achievement a given behavior will expect desirable outcomes for that behavior and the person will tend to perform that behavior.

In consideration to hypertension control, perceived self - efficacy is a cognition that has been proved for its correlation with lifestyle modification behaviors

in people with hypertension. Findings from previous studies found that perceived self-efficacy is important in influencing lifestyle modification behaviors including dietary behavior, exercise behavior, weight control, and salt consumption in adults with hypertension (Corne ́ lio et al, 2012; Lee et al., 2010; Tantayothin, 2004; Wingo et al., in press), particularly in Thailand. For example, Pinprapapan et al. (2013) found that perceived self-efficacy had a positive direct effect on adherence to therapeutic regimens (i.e., lifestyle modification and medical adherence) among adults with hypertension in Northern Thailand ($\beta = .54$, $p < .01$).

Existing instruments of self-efficacy

Based on the literature review, there are several published Models of Goal Directed Behavior, and four published instruments were found.

(1) Self-Efficacy for Managing Chronic Disease 6-Item Scale (SES6C): The Stanford Patient Education Resource Center (2012) established and validated the SES6C. The scale encompasses several domains that are common across many chronic illnesses including symptom control, role functioning, emotional functioning, and communicating with physicians. The scale measures how confident patients with chronic disease are in doing certain activities. It consists of 6 items that are rated on a 10-point scale ranging from "not at all confident" to "totally confident". Hu, Li, and Arao (2013) has used the original SES6C with patients with hypertension. Psychometric properties were measured in 262 hypertension patients who were registered at a health clinic in Beijing, China. Exploratory factor analysis was performed on the items to test the scale. The psychometric data displayed acceptable results that presented good Cronbach's alpha and split-half (.88 and .80 respectively). It represented an acceptable internal consistency. The ICC of individual items ranged

from .68 to .76. All of these ICCs were in the good to excellent reliability range. The original version of the SES6C is free to use without permission.

(2) Self-Efficacy Scale (SES): this scale was developed by Lee et al. (2010) which was modified from the Hypertension Belief Scale (Bloomfield et al., 1993 cited in Lee et al., 2010). The scale was measured in middle-aged adult Korean Americans with hypertension and assessed how confident an individual is in managing hypertension in 11 relevant areas (including cutting down on cigarette smoking, reducing worry or anxiety in life, losing weight, avoiding too much alcohol, cutting down on salt, avoiding working too much, taking prescribed anti-hypertensive medication, drinking less coffee with caffeine, eating less fatty foods, lowing cholesterol, and exercising). A 4-point Likert scale responds ranging from ''not at all confident'' to ''very confident''. The Cronbach's alpha of this scale was .67 at the baseline.

(3) Exposure of Self-efficacy to Manage Hypertension Scale (ESHS): this scale was developed from Warren-Findlow et al. (2012) which was modified from Lorig et al. (1996 cited in Warren-Findlow et al., 2012) This scale consists of five items which are a 10-point scale with responses from "not confident at all" to "totally confident". Each item begins with the phrase "How confident are you that you can …?". For example, one of the questions is 'How confident are you that you can reduce the emotional distress caused by your high blood pressure so that it does not affect your everyday life? This scale was measured in 190 African Americans with hypertension. Internal consistency for the measure was good ($\alpha = .81$).

(4) Hypertensive Self-Efficacy Scale (HSS): this scale was developed by Pinprapapan et al. (2013) which had been modified from the Perception of Self-

efficacy Questionnaire by Kairoj (1999 cited in Pinprapapan et al., 2013). The HSS assessed the perception of persons with hypertension concerning their confidence to perform required recommendations such as taking antihypertensive medication, dietary modifications, weight control, physical exercise, avoiding risk factors, stress management, and follow-up visits to control their own blood pressure. For example, one of the questions is 'You can take medicine for hypertension treatment every day'. The 26-items had four responses ranging from 'less confidence' to 'most confidence'. The internal consistency reliability of the scale was .96.

To sum up, the Hypertensive Perceived Self-efficacy Questionnaire (HPSQ) was used to measure self-efficacy in the proposed model. The questionnaire was modified from the Self-Efficacy for Managing Chronic Disease 6-Item Scale (SES6C) developing by Hu et al. (2013). They modified the original SES6C for patients with hypertension. Psychometric properties were measured in 262 hypertension patients who were registered at a health clinic in Beijing, China. Exploratory factor analysis was performed on the items to test the scale. The psychometric data displayed acceptable results that presented good Cronbach's alpha and split-half (.88 and .80, respectively). It represented an acceptable internal consistency. All of these ICCs were in the good to excellent reliability range. The original version of the SES6C is free to use without permission. Hence, the SES6C was fit with the evaluation of self-efficacy in the proposed model following these reasons such as the scale was specific to the hypertension population, the scale was cleared about what to include in a measure, the final item pool was not redundant, the number of items was enough, and the instrument properties were acceptable.

2.2 Trying

Trying plays a key process intervening between intentions and behavior. To fulfill an individual's goal, he/she must see his or her own action as a purposive attempt where foresight and effort are needed (Taylor et al., 2001). The implementation of goal-directed behavior will be effective when motivation and commitment have to be marshaled, temptations resisted, and impediments overcome (Taylor et al., 2001; 2005). Trying is defined as an individual assessment of how much effort one will expend or has expended in goal pursuit which tries in the senses of devoting time to planning, expending mental/physical energy, maintaining will power, and sustaining self-discipline (Taylor et al., 2005). For example, in the goal of reducing blood pressure, patients seek their task such as taking medication, exercising, following a healthy diet, reducing salt consumption, and relaxation as one of trying to do the things needed to reach this goal.

Based on the definition of trying from Taylor et al. (2001, 2005), there was no study found that examined the relationship between trying and behavior in adults with hypertension. According to previous studies in related disciplines, there were few studies about trying in hypertension. For example, Zhao et al. (2009) found that trying to lose weight predicted a high score on weight control behaviors among overweight adults with hypertension in the US (OR=1.11, 95% [CI]: 1.05–1.17). However, a previous study in similar populations presented that trying related to behavior. Andreyeva et al. (2010) and Rideout & Barr (2009) studied adults with obesity and postmenopausal women, and they reported that trying to lose weight had a significant positive direct effect on engaging in physical activity and a higher intake of fruit and vegetable consumption (β = .06 and .70, respectively). Similarly, Gordon,

Heath, Holmes, and Christy (2000) found that trying to lose weight predicted high scores on engaging in physical activity in overweight adults in the US (OR=1.3, 95% [CI]: 1.14–1.51).

Existing instruments of Trying

Based on the literature review three published instruments were found. The instruments are described and the psychometric data is summarized.

(1) Self-regulation of Hypertension Questionnaire (SHQ): Taylor et al. (2001) developed this questionnaire from previous studies (Ajzen, 1991; Bagozzi & Edwards, 1998). This questionnaire was created for the assessment of self-regulation decisions to control hypertension in 240 adult patients with hypertension at a hypertension clinic. The SHQ consists of nine domains which are attitude toward success, attitude toward failure, attitude toward process, subjective norms, desire, perceived behavioral control, intentions, trying, and past trying. Thus, trying is one of the nine domains in this questionnaire. Trying was measured with four 5-point items reflecting how hard the patient tried to reduce (maintain) his/her blood pressure in the 4 weeks. The four domains of trying included devoting time for planning, expanding a lot of energy to reduce (maintain) blood pressure, maintaining will power to reduce (maintain) blood pressure, and maintaining self-discipline to reduce (maintain) blood pressure. In regards to the instrument properties, the reliability coefficient (Cronbach's alpha) of all items of trying was generally quite high (.90).

(2) Model of Goal-directed behavior Questionnaire (MGBQ) Modified Version: Taylor et al. (2005) developed this instrument from previous studies (Ajzen, 1991; Bagozzi & Edwards, 1998; Perugini & Bagozzi, 2001) which were based on the Theory of Planned Behavior (TPB) and the Model of Goal-directed

behavior (MGB). This instrument was created for the assessment of self-regulation decisions to control hypertension in 208 patients at a hospital clinic. The MGB questionnaire includes anticipated emotions, attitudes, subjective norms, perceived behavioral control, desire, intentions, trying, and past behavior. Thus, trying is one of nine domains in this questionnaire. The four domains of trying are devoting time for planning, expanding a lot of energy to reduce (maintain) blood pressure, maintaining will power to reduce (maintain) blood pressure, and maintaining self-discipline to reduce (maintain) blood pressure. Trying is measured with four 5-point items reflecting how hard the patient tried to reduce (maintain) his/her blood pressure in the 4 weeks and with response from 'not at all' to 'extremely hard'. In regards to the instrument properties, the reliability coefficients (Cronbach's alpha) of all items of trying were generally quite high (.93 - .94).

(3) Model of Goal-directed behavior Questionnaire (MGBQ) Modified Version 2006: Taylor et al. (2006) developed this instrument from previous studies and it is based on the JNC-6. This instrument was created for the assessment of self-regulation decisions to control hypertension in 196 hypertensive patients at a hospital clinic. Before creating the questionnaire, qualitative research was used for exploring the differences in means between those patients who did and did not mention their goals. Finally, the MGB questionnaire included attitudes, subjective norms, perceived behavioral control, desire, goal intention, and trying. Thus, trying was one of the nine domains in this questionnaire.

Trying is measured by four items was and the responses are by a five-point scale from 'not at all' to 'extremely hard'. Trying was measured with four 5-point items reflecting how hard the patient tried to reduce (maintain) his/her blood

pressure during the past 4 weeks in each of the following senses: devoting time for planning, expanding a lot of energy to reduce (maintain) blood pressure, maintaining will power to reduce (maintain) blood pressure, and maintaining self-discipline to reduce (maintain) blood pressure. In regards to the instrument properties, CFA was used. The reliability coefficients of the constructs were generally quite high (.79 – .94), particularly the reliability of trying was quite high (.90).

In summary, trying was measured by the Model of Goal-directed behavior Questionnaire (MGBQ) modified by Taylor et al. (2005). Trying was a part of all six parts of this instrument. The instrument fit with these variables because the researchers used the Model of Goal-directed behavior (MGB) (Perugini & Bagozzi, 2001) to establish a conceptual framework in their study. In regards to the instrument properties, this instrument was created for assessing self-regulating decisions to control hypertension, and was tested in 208 patients at a hospital clinic. The acceptable result presented that the reliability coefficients (Cronbach's alpha) of trying part was high.

2.3 Social Support

Based on the literature review, social support is included in this study as an influencing on lifestyle modification behaviors among Thai adults with hypertension. Social support is defined as thought affecting mental and physical health through its influence on emotions, cognitions, and behaviors (Cohen, Underwood, & Gottlieb, 2000). Cobb (1976) stated that social support is the information that leads people to believe they are cared for, loved, esteemed, valued, and a member of a network of communication and mutual obligation. In addition, Gottlieb and Bergen (2010) defined social support as the social resources that persons

perceive to be available or that are actually provided to them by nonprofessionals in the context of both formal support groups and informal helping relationships. Thus, social support is defined as various forms of help or assistance and how often they have received these types of support from a person with whom they are in a personal relationship.

Types of Social Support

The type of social support has been defined in numerous social support studies. Social support is divided by function in two models (Cohen et al., 2000). The main effect model consists of network members who are subject to social controls and peer pressure that influence health behaviors such as diet, exercise or smoking. Information influences health-relevant behaviors and positive psychological states are presumed to be beneficial because they reduce psychological despair or suppress neuroendocrine responses. In addition, the stress-buffering model refers to the roles of social support responses to potentially stressful events.

Furthermore, House (1981) proposed the conceptualization of social support which has four types of social support as emotional, instrumental, informational, and appraisal support. Emotional support involve conveying the perception of caring, love, and trust to others such as the experience of feeling liked, admired, respected. Instrumental support refers to the provision of goods and services needed by the recipient such as the provision of tangible aid, goods, and services. Informational support is information provided to another during a time of stress. It is the provision of information to individuals during a stressful situation. Appraisal support involves providing assistance with self-evaluation and involves affirming the appropriateness of actions or statements made by other individuals.

According to Cohen and McKay (1984), they divided social support into the following three sections; tangible, appraisal, and emotional support. Tangible support refers to the required resources that could provide someone in need with money, care, or other forms of assistance. It is probably most effective when the provision of aid is viewed by the recipient as appropriate. Appraisal support plays as a supporter about altering either one's assessment of a threat or one's assessment of their ability for coping. Emotional support involves feelings of control, self-esteem in the resistance to and recovery from disease, feeling of belonging, and/or being loved. Although, the types of social support have been divided in several ways, the characteristics of these types are similar. Thus, social support in this study is defined as various forms of help or assistance including appraisal, emotional support, and tangible support.

Social support in adults with hypertension

In regards to hypertension, social support plays a critical role in helping patients to control blood pressure levels. Social support is increased by simple communication, role modeling, relieving pressure, and the beliefs and behaviors of family and friends. These are important influences on the therapy of patients with hypertension. Because of the difficulty in successful pharmacological and non-pharmacological treatments, the role of social support becomes important in helping to solve this problem.

Social support refers to a network of individuals, i.e., family, friends, and neighbors, who are available to help in times of psychological, physical, or financial distress. Social support is a social factor that can be viewed as a buffer to the development of hypertension. Individuals who have a social support network upon

which they can depend in times of stress tend to have lower blood pressure and are better equipped to handle stress in a positive way. Individuals who do not have a social support network upon which they can depend tend to internalize their stress and cope negatively with the situation (Chiumento, 2008).

Social support for lifestyle modification behavior in adults with hypertension refers to the adult's evaluation about the frequency of receiving informational, emotional, and instrumental assistance from family members, friends, medical and health personnel. These supports can help the adult with hypertension move towards the goal of lifestyle modification behaviors. For example, family or friends can encourage hypertensive patients to eat healthy foods, remind them to take their medication, and they should not cook foods or offer foods to adults with hypertension that they should not eat or encourage them to try the foods (Ford et al., 2010). Furthermore, social support influences patients' decision making about lifestyle modification behaviors by reducing stress that can be a barrier for appropriate adaptation (Leeracharas, 2005; Purateeranrath, 2011).

In Asian cultures as in Thailand, family members will take care of the patients as a care giver (Nilchaikovit et al., 1993). Thai families are brought up to have close family ties and to respect adults or the elderly, thus when a family member suffers from an illness he or she will seek help and care from their family first (Purateeranrath, 2011). For example, most Thai people with hypertension tend to discuss their day and any problems about hypertension management at dinner time which is a suitable time for meeting with their family (Kebwai, 2006). In regards to information support, Thai people with hypertension receive treatment from healthcare providers because they have trust and faith in them as well as holding the healthcare

providers in high regard. Social support as factors outside the person can induce or facilitate a person to get support for acting or modifying a behavior following the advice or supporter (Sukprungprom, 2008).

Existing measurement of social support in adults with HTN

Social support instruments are often used for measure in chronic illness. Based on the literature review, there are several publications of social support instruments in Thailand and other countries. However, social support instruments developed for Thai adults with hypertension were reviewed in this study, yet only two published instruments were found to measure social support concepts related to adults with hypertension. The instruments are described and the psychometric data is summarized.

(1) The Hypertensive Social Support Scale (HSSS): This instrument was modified by Pinprapapan et al. (2013) based on the previous instrument which was developed from the Social Support Questionnaire by Pongudom (2005 cited in Pinprapapan et al., 2013). They conducted an assessment about the level of perception such as emotional, informational, appraisal, and instrument support for adherence to therapeutic regimens in 321 Thai adults with essential hypertension who followed up at four hypertension clinics in a public hospital in northern Thailand. This instrument is measured on a 4-point scale from 'not true' to 'strongly true' in 20 items. A total score ranges from 20-80 by summing the response values across all items, and a higher score specified higher social support. The internal consistency coefficient of the Hypertensive Social Support Scale (HSSS) was .84. Likewise, good instrument properties are considered to select this instrument for this study.

(2) The Social Support Scale (SSS): Leelacharas (2005) developed this instrument from Toljamo and Hentinen (2001 cited in Leelacharas, 2005). This instrument was used for measuring the social support of medical-taking behavior including emotional support, instrumental support, informational support, peer support, and financial support among 253 Thai women with hypertension at Ramathibodi Hospital in the Department of Medicine Outpatient Clinic and the Department of Family Medicine Outpatient Clinic. The Social Support Scale consists of 12 items with a five-point scale scoring from strongly disagree (score = 1) to strongly agree (score = 5). The possible total scores could range from 12 to 60. The higher scores mean high social support and the lower scores mean low social support. The psychometric properties of the Social Support Scale, and the internal consistency reliability (Cronbach's alpha) of the original instrument (Toljamo and Hentinen, 2001 cited in Leelacharas, 2005) was .70 - .78. Factor analysis was used for testing validity. The results of factor analysis found that five factors were loaded from .63 - .96 and accounted for 69% of the total variance. The modified version of Leelacharas (2005) was tested for internal reliability (Cronbach's alpha) for the total scale and the result was .75. Although the properties of instrument were acceptable, there were quite small items and the concept for development instrument differs from this study.

In conclusion, social support is defined as an individual's perception about receiving help or assistance including: emotional support, instrumental support, informational support, and appraisal support from a person with whom he or she is in a personal relationship with during the past month. Social support will be evaluated by the person's score on the Hypertensive Social Support Scale which was developed by Pinprapapan et al. (2013) for measuring social support

including emotional support, instrumental support, informational support, and appraisal support, which is similar to the proposed model in this study. According to the same population under study and the acceptable results of the psychometric properties, this instrument is a fit with this study.

2.4 Illness identity

From the literature review, illness identity which is a sub-component of Leventhal's self-regulation model influences lifestyle modification in adults with hypertension. According to Leventhal et al. (2003), the self-regulation model is useful for understanding how people think about their illness and how this subjective viewpoint may guide individual adherent behaviors and health outcomes. Illness identity refers to the label or name given to the condition and the symptoms that appear to go with an illness or it can be called "the disease label and its symptom indicator" (Leventhal et al., 2003). When a symptom is present, patients usually look for causes of the illness and change their actions to cope with the illness.

Illness identity in adults with hypertension

In regards to the consideration of hypertension control, the majority of patients who have no symptoms with hypertension do not feel unwell and therefore, this may encourage noncompliance. The previous studies found that illness identity had a negative direct effect on self-management (i.e., dietary patterns, exercise behavior) in adults with hypertension (Chen et al., 2009; Chen et al., 2011). Nilchaikovit et al. (1993) mentioned that Asians are expected to be calm and to control their emotions when they are in any unpleasant circumstances.

Many Thai people have both workplace and household responsibilities and as a result they may not seek health care since hypertension in the

early stages often shows no symptoms and they may delay or only come to the hospital when their symptoms are advanced (Leelacharas, 2005; Leelacharas & Rujiwatthanakorn, 2012). According to Leelacharas (2005), 230 Thai women with hypertension reported that the four most common symptoms of hypertension were dizziness, headaches, fatigue, and sleeping difficulties. Thai hypertensive women tended to believe that hypertension was permanent and would continue for a long time. About 45% of hypertensive patients tended to view high blood pressure as a serious condition, while 32% of hypertensive patients disagreed with this.

Existing instruments of illness identity in adults with HTN

The existing instruments of illness identity in adults with hypertension have been published in one previous study in Thailand. The Illness Identity Scale (Thai Version) is a part of the Illness Perception Questionnaire (IPQ) Thai Version for patients with hypertension. Leelacharas (2005; Leelacharas & Rujiwatthanakorn, 2012) modified this from Weinman, Petrie, Moss-Morris, and Horne (1996). The Illness Identity scale was composed of 12 items on a 4-point Likert scale. Respondents were asked to indicate "Do you think your high blood pressure causes you to experience the following symptoms (e.g., pain, headaches, etc.)?" as part of their high blood pressure condition to measure the symptom components of identity of hypertension and uses yes/no responses. The symptom item (s) of "yes" responses were given scores (1 score). All given scores are summed for identity. The scale ranged from 0 to 12. The internal consistency coefficient of Illness Identity scale was tested by using Kuder-Richardson 20 and the result was .76.

The Causal Relationships among Explanatory Variables and Lifestyle

Modification Behaviors in Adults with Hypertension

The causal relationships among explanatory variables and the lifestyle modification behaviors in adults with hypertension has been reported in many correlation studies. Regarding the existing causal models of HTN behavior, four models were found in adults with hypertension in several countries such as Korea, Taiwan, USA, and Thailand. Firstly, Yang et al. (2010) developed the model of blood pressure control to examine among community-dwelling hypertensive adults in Korea. The researchers found that 12 of the 24 hypothesized paths in the structural model were significant. Gender (β = .09, p < .00), medication (β = -.24, p < .00), regular physical activity (β = .06, p = .02) and comorbidity (β = .14, p < .00) were significantly associated with blood pressure control, accounting for 10% of the variance in blood pressure control. The fit of the model to the data was supported also.

The model of adherence to therapeutic regimens (including prescribed medication and self-management) among patients with HTN was developed and studied by Chen et al. (2011). The researchers revealed that the paths in the final model from control (t = 4.06, β = .41), cause (t = -2.49, β = -.25) and illness identity (t = 2.09, β = .23) to adherence to the prescribed medication were statistically significant. The effect from control to adherence to self-management was also statistically significant (t = 2.88, β = .52). Illness identity had a significant positive effect on cause (t = 4.08, β = .37) and a negative IR (t = 4.86, β = .48), but a significant negative effect on control (t = -2.63, β = -.27). The indirect effects from illness identity to medication and self-management adherence were -.20 (t = -2.75,

$p < 0.01$) and -.30 (t = -2.53, $p < 0.05$). The final model accounted for 27% and 71.5%

of the variance in adherence to the prescribed medications and self-management

recommendations respectively.

Taylor et al. (2005) developed and test the model of Goal-Directed Behavior

to explain self-regulation decisions to control hypertension among patients with HTN.

The researchers examined and analyzed the model in two types such as gender and

goal-types (including reducers and maintainers). For gender, influences on desire

were found for attitude (β = .26, p < .05), perceived behavioral control (PBC)

(β = .25, p < .05) and positive anticipated emotions (PAE) (β = .30, p < .05) for men;

influences on desire were found for PBC (β = .28, p < .05), and PAE (β = .27, p < .05)

for women. Furthermore, influences on intentions were discovered from PBC

(β = .37, p < .01), and desire (β = .73, p < .01) for men; influences on intentions were

found for PBC (β = .51, p < .01), and desire (β = .48, p < .05) for women. Finally,

influences on trying were revealed for PBC (β = -.36, p < .05), past behavior (PB)

(β = .50, p < .01) and intentions (β = .59, p < .05) for men; significant effects on

trying were revealed for PB (β = .69, p < .01) for women.

For goal-types, the researchers additional revealed that influences on desire

were found for attitude (β = .35, p < .05) and subjective norm (SN) (β = .20, p < .05)

for maintainers; influences on desire were found for SN (β = .26, p < .05), PB

(β = .30, p < .01), and PAE (β = .38, p < .05) for reducers. Similarly, influences on

intentions were discovered for PBC (β = .31, p < .05) and desire (β = .78, p < .05) for

maintainers; influences on intentions were found for PBC (β = .40, p < .01) and desire

(β = .51, p < .01) for reducers. Finally, influences on trying were revealed for PB

(β = .74, p < .01) for maintainers; influences on trying were found for PB (β = .35, p < .01) and intentions (β = .52, p < .01) for reducers.

In Thailand, only one full causal model was found that examined behaviors in Thai adults with hypertension. Pinprapapan et al. (2013) proposed and tested the model of Adherence to Therapeutic Regimens (ATR) (including medication taking behavior and lifestyle modification behaviors) among Thai adults with hypertension. The researcher presented that the final causal model of adherence to therapeutic regimens fit with the data (χ^2 = 2.19, df = 5, p = .82, RMSEA = 0.00, GFI = 1.00, AGFI = .99, CFI = 1.00, RMR = 0.014, SRMR = 0.014). The model accounted for 49% of the total variance in adherence to therapeutic regimens. Adherence to therapeutic regimens was directly and positively influenced by perceived self-efficacy (β = .54, p < .01), provider-patient communication (β = .43, p < .01), and social support (β = .14, p < .01). In addition, social support was indirectly affected by adherence to therapeutic regimens (β = .21, p < .01) via perceived self-efficacy. Health belief was positively and indirectly affected on adherence to therapeutic regimens (β = .23, p < .01) via perceived self-efficacy. Knowledge of hypertension was directly influenced by provider-patient communication (β = .60, p < .01).

In consideration to this study, the proposed model differs from the existing models in three aspects; domain factors, intervening variable, and relevance for Thai context. Firstly, the proposed model is composed of the following three domain factors; affective factors, cognitive factors, and social factors. Whereas, the three previous model examined their model in one or two domain factors. For example, the ATR model consisted of the cognitive and social factor (Pinprapapan et al., 2013). The previous model by Taylor et al. (2005) examined the cognitive factors and the

affective factors. Moreover, the model of blood pressure control among hypertensive adults in Korea examined only non-modifiable factors (Yang et al., 2010)

The second aspect is that intention and trying were intervening variables in the proposed model in this study which differed from other models. Intention was proposed as intervening variables in the model by Taylor et al. (2005). Perceived self-efficacy as an intervening variable in the ATR model (Pinprapapan et al., 2013). The model by Chen et al. (2011) cause, control, and negative illness representation were intervening variables. Furthermore, the model by Yang et al., 2010) did not present an intervening variable in the proposed model.

Lastly, social support and self-efficacy were included in the model because these two variables significantly affected lifestyle modification behaviors among Thai adults with HTN in several studies. About five previous studies in Thailand found that social support significantly correlated with and predicted lifestyle modification behaviors in Thai hypertensive patients (Baiya, 2011; Piamnoom, 2007; Pinprapapan et al., 2013; Kebwai, 2006; and Sukprungprom, 2008). Also, self-efficacy was supported empirically as a predictor of lifestyle modification behaviors in adults with hypertension (i.e. exercise behavior, eating behavior, and weight control) in Thailand. Self-efficacy had a positive direct effect on lifestyle modification behaviors among Thai adults with hypertension in several studies (Kebwai, 2006; Khongchoom, 2009; Pinprapapan et al., 2013; Tantayothin, 2004). Therefore, the proposed model differs from existing models across countries.

Therefore, the causal model of lifestyle modification behaviors in Thai adults with hypertension is proposed in this study (see Figure 5). Attitude, perceived behavioral control, desire, and intention were based on the Model of Goal-Directed

Behavior. Social support, illness identity, trying, and self-efficacy were based on the literature review. The path was made based on the results from previous studies.
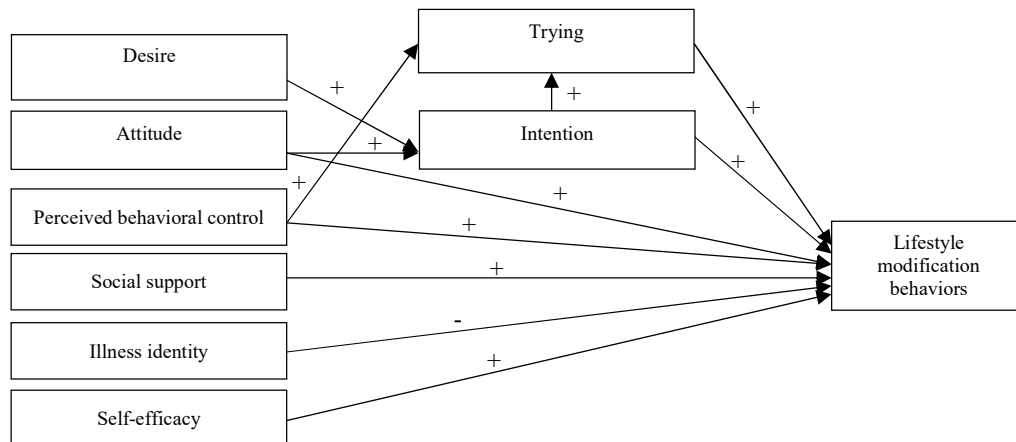

Figure 5. The proposed of causal model of lifestyle modification behaviors in Thai adults with HTN

Summary

Hypertension remains a leading cause of chronic illness in Thailand. Although, several previous studies examined about implementation in adults with hypertension, the morbidity and mortality rate of hypertension in Thailand still increases each year. Consequently, poor blood pressure control is a serious problem in adults with hypertension. A key strategy for maintaining blood pressure levels is lifestyle modification such as dietary modifications, weight control, smoking cessation, physical activity, alcohol consumption, and stress management. There were several factors influencing lifestyle modification behaviors in adults with hypertension in many previous studies.

The literature reviewed showed that the factors influencing lifestyle modification behaviors in adults with hypertension are modifiable and non-modifiable factors, and can be divided into the three aspects of biological, psychological, and

sociological. Some factors had a positive influence on lifestyle modification behaviors, whereas some factors had a negative influence on lifestyle modification behaviors in adults with hypertension. In this study only modifiable and powerful variables which can be modified and changed in order to control blood pressure level were selected.

Based on the Model of Goal-Directed Behavior, some variables in this model were significantly associated with lifestyle modification behaviors among adults with hypertension which consist of attitude, perceived behavioral control, desire, and intention influencing lifestyle modification behaviors in adults with hypertension. Furthermore, the explanatory variables such as trying, social support, self-efficacy, and illness identity, were added in this study. According to the review of the literature, the researcher assumed that the proposed model would fit with Thai adults with hypertension.

Chapter 3

Research Methodology

This chapter presents a description of the methodology in this study including the study design, population and sample, instrumentation, data collection, protection of human subjects, and data analysis.

Research Design

A path analytic design was used to examine the proposed relationships among selected explanatory variables and lifestyle modification behaviors for hypertension. The explanatory variables were: attitude, perceived behavioral control, desire, intention, trying, social support, self-efficacy, and illness identity. A set of questionnaires was used to assess all explanatory variables and lifestyle modification behaviors in Thai adults with hypertension.

Setting

The study was conducted at out-patient clinics in five general hospitals which were located in five different regions in Thailand.

Population and Sample

Population

The target population for this study were Thai adults who had been diagnosed by physicians as having hypertension.

Sample

The samples were adults with hypertension who followed up at out-patient clinics at the hospitals in Thailand and met the following inclusion criteria:

1. Being aged between 35 and 59 years (because the prevalence rate of hypertension increased in this aged group (Thonghong et al., 2013)).

2. Being diagnosed with essential hypertension by physicians.

3. Taking antihypertensive medications for at least 6 months (because changing to a new behavior requires at least 6 months (Pinprapapan et al., 2013)).

4. Able to communicate in Thai language.

5. Not having a serious mental illness such as dementia or other mental disorders or severe comorbidities such as heart disease, end stage renal failure, or paralysis

Sample size determination

This study had comprised eight independent or explanatory variables. Nunnally and Bernstein (1994, cited in Munro, 2001) recommend that 30 samples per an independent or explanatory variable. Therefore this study required 240 samples.

Sampling method

A stratified random sampling method was used for selecting a representative sample of Thai adults with hypertension (Figure 6).

(1) There are 77 provinces in Thailand and there are 74 general hospitals. Since some general hospitals provide secondary and non-specialized care, have a moderate capacity, and have chronic illness out-patient clinics such as hypertension clinics, these hospitals were appropriate for the recruitment of the

sample. Therefore, the researcher divided all general hospitals into the following 5 different regions; center, east, north-east, north, and south.

(2) For diversity, the researcher randomly selected one general hospital in each region. The following five general hospitals were selected as study sites; Trat Hospital (Trat Province), Naradhiwasrajanagarindha Hospital (Narathiwat Province), Nan Hospital (Nan Province), Somdetphraphutthalertla Hospital, (Samutsongkram Province), Mahasarakham Hospital (Mahasarakham Provice).

(3) The number of participants was proportionate with the number of out-patient adults with hypertension who followed up at the hypertension clinic in each selected hospital. In all, 240 participants were recruited for this study (Table 2). The samples in each hospital were selected when they met the inclusion criteria of the study.

Table 2

Number of Participants Proportionate with The Number of Out-Patient Adults who Followed Up at Hypertension Clinics in Selected Hospitals

Hospital Name	Number of adult out-patients in selected hospitals	Proportion Allocation	Number of samples
1.Somdetphraphutthalertla	2,776	(2,776 x 240)/14,723	45
2.Mahasarakham	1,469	(1,469 x 240)/14,723	24
3.Naradhiwasrajanagarindha	3,743	(3,743 x 240)/14,723	61
4.Nan	4,289	(4,289 x 240)/14,723	70
5.Trat	2,446	(2,446 x 240)/14,723	40
Total	**14,723**		**240**

			77 provinces in Thailand		

	74 general hospitals	

North (15 hospitals) : Kamphaengphet H, Nakornping H, Phichit H, Nan H, Phetchabun H, Phrae H, Lamphun H, Phayao H, Sukhothai H, Sot H, King Taksin H, Sisangvone H, Srisangwan H, Chiangkham H, Mae Sai H.

Northeast (16 hospitals) : Roiet H, Sakonnakhon H, Kalasin H, Mahasarakham H, Chaiyapum H, Yasothon H, Nongkhai H, Nakhonphanom H, Loie H, Mukdahan H, Amnatcharoen H, Sirindhorn H, Nongbualamphu H, Choom Pae H., BuengKan H., Phu Kaew H.

East (3hospitals) :Sothon H, Trat H, Sakaeo Crown Prince H

Central (24 hospitals); Pranangklao H, Banpong H, Kingnarai H, NakhonNaYok H. Phaholpolpayuhasaena H, Narenthornchainat H, Phra Phutthabat H, Prachomklao H, Somdetphraphutthalertla H, Samutprakarn H, Pathumthani H, Singburi H, Angthong H, Makarak H, Photharam H, Banmi H, Inburi H, Somdejprasangkharach XVII H, Sena H, Pracuapkirikhan H, Huahin H, Damnoensaduak H, Samutsakorn H, Uthaithani H.

South (13 hospitals); Ranong H, Chumphon Khet udomsakdi H, Phattalung H, Krabi H, Phangnga H, Satun H, Samui H, Betong H, Suhai-kolok H, Songkla H., TungSong H., Takuapa H, Pattani H., Pakpanang H., Naradhiwasrajanagarindra H, Thasala H.

Simple random selection for representative hospitals having a hypertension clinic of each region

Nan Hospital	Mahasarakham Hospital	Trat Hospital	Somdetphraphutthalertla Hospital	Naradhiwasrajanagarindha Hospital

4,289 subjects	1,469 subjects	2,446 subjects	2,776 subjects	3,743 subjects

Sample proportions (n = 240 subjects)

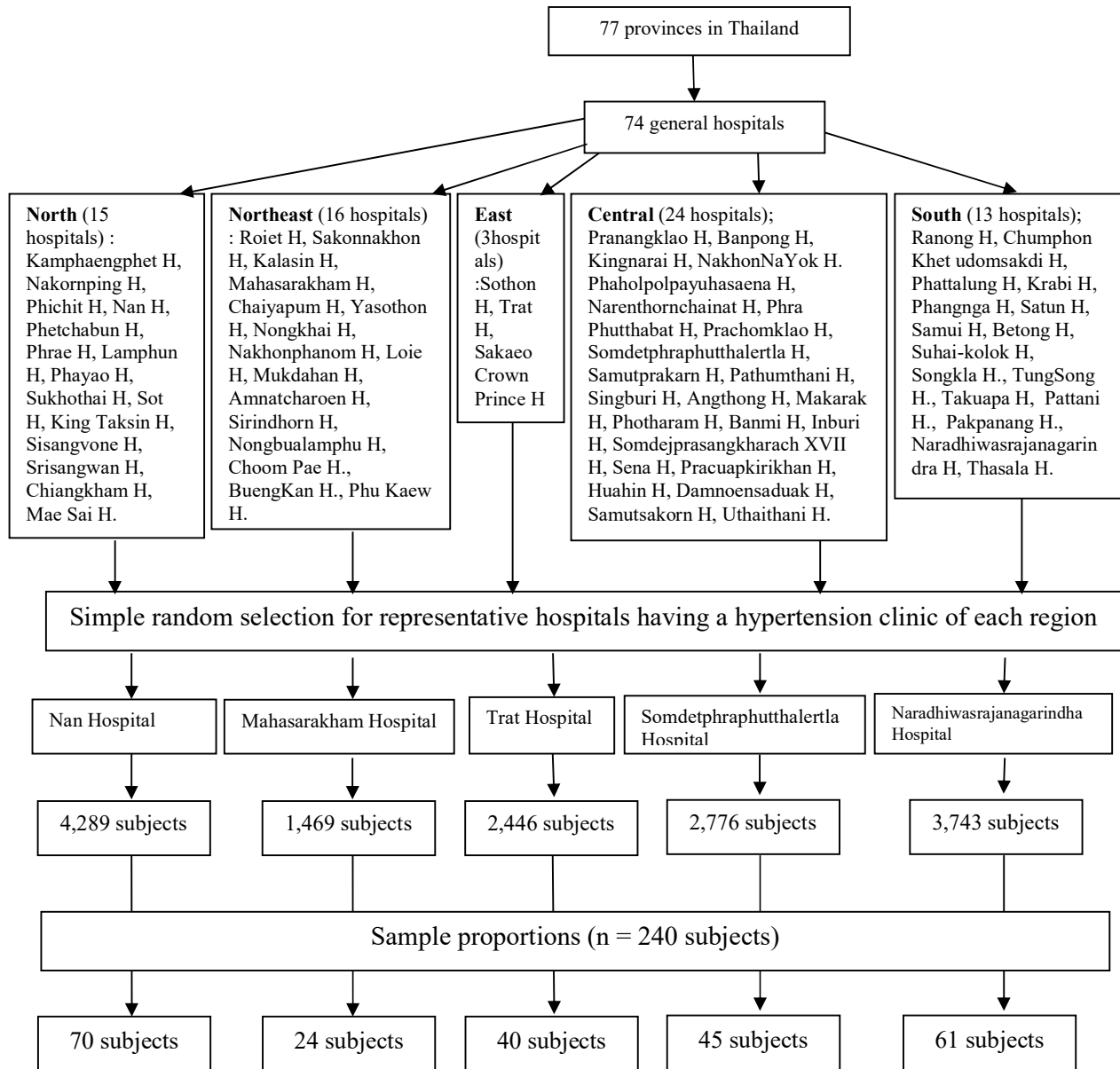| 70 subjects	24 subjects	40 subjects	45 subjects	61 subjects

Figure 6. A Stratified Random Sampling in a Path Analytic Study.

Instrumentations

A set of self-administered questionnaire was used to measure all variables. Firstly, The Demographic Data Questionnaire was used to collect demographic characteristics of adults with hypertension. Then, the Model of Goal-directed Behavior Questionnaire was used to measured attitude, perceived behavioral control, desire, intention, and trying. Next, social support for hypertension was measured by the Hypertensive Social Support Scale and self-efficacy was measured by the Perceived Self-efficacy about Hypertension Questionnaire. Illness identity was measured by the Illness Identity Scale. Finally, the Lifestyle Modification Behaviors Questionnaire was used for measured the lifestyle modification behavior. All of these questionnaires were presented in Table 3.

Table 3: Instruments of the study

Concepts	Variables	Instruments	Level of Measurement	Validity	Reliability
Demographics	Age	DDQ	Number of years since birth up to the data collection: *interval*	Face validity	
	Gender	DDQ	Male/ Female: *nominal*		
	Religion	DDQ	Buddhism/ Islam/Christ: *nominal*		
	Marital status	DDQ	Single/Married/ Divorced/Widowed : *nominal*		
	Family members	DDQ	Number of family members: *ratio*		
	Education	DDQ	Level of education: *ordinal*		
	Income	DDQ	Monthly household income in Thai Bath: *ratio*		
	Year of diagnosed	DDQ	Number of years since diagnosed up to the data collection: *ratio*		
	Anti-hypertensive drug taking	DDQ	Number of anti-hypertensive drug: *ratio*		
Attitude	Attitude	MGBQ	Total scores on attitude part: *ratio*	-	α = .78
PBC	PBC	MGBQ	Total scores on PBC part: *ratio*	-	α = .85
Desire	Desire	MGBQ	Total scores on desire part: *ratio*	-	α = .80
Intention	Intention	MGBQ	Total scores on intention part: *ratio*	-	α = .75
Trying	Trying	MGBQ	Total scores on trying part: *ratio*	-	α = .95
Social support	Social support	Thai-HSSS	Total scores on Thai-HSSS: *ratio*	-	α = .93
Self-efficacy	Self-efficacy	HPSQ	Total scores on HPSQ: *ratio*	CVI = .80	α = .91
Illness identity	Illness identity	Thai-IIS	Total scores on Thai-IIS: *ratio*	CVI = .80	*KR*20 = .77
LMB	LMB	LMBQ	Total scores on LMBQ: *ratio*	CVI = .80	α = .91

Note. LMB = Lifestyle modification behaviors, PBC = Perceived behavioral control, DDQ = The demographics Data Questionnaire, MGBQ = The Model of Goal-directed Behavior Questionnaire, Thai-HSSS = The Thai version of Hypertensive Social Support Scale, HPSQ = The Hypertensive Perceived Self-efficacy Questionnaire, Thai-IIS = The Thai version of Illness Identity Scale, LMBQ = The Lifestyle Modification Behavior Questionnaire

1. Demographic data questionnaire

The Demographic Data Questionnaire was developed by the researcher to collect demographic characteristics of adults with hypertension. The questionnaire consisted of 16 items and asked about age, gender, occupation, education, marital status, religion, monthly income, family members, source of knowledge about hypertension control, and history of hypertension such as year of diagnosed with hypertension, previous blood pressure levels over few visits, comorbidities, anti-hypertensive drugs taken and other drugs, future appointment recommended in weeks.

2. Lifestyle modification behaviors questionnaire

The researcher modified the Lifestyle Modification Behaviors Questionnaire (LMBQ) from the Adherence to Lifestyle Modifications Questionnaire developing by Limcharoen (2006). The original questionnaire asked about frequency of self-care practice about lifestyle modification behaviors including dietary consumption, physical activity, avoiding risk factors, stress management, and follow up. Also, the original questionnaire consisted of 21 items and it was measured on an 11-point Likert's scale with response from 'never' (0 score) to 'always' (10 scores).

To measure the lifestyle modification behavior in this study, the original questionnaire was modified under permission (see Appendix F). Nine items about action for changing behavior for adults with hypertension which was recommended for blood pressure control by the JNC-8 guideline (James et al., 2014) and Thai Hypertension Society (2012) were added. Thus, the final questionnaire consisted of 30 items and was divided into five sub-scales such as dietary consumptions, physical activity, avoiding risks, stress management, and seeking follow up. The LMBQ was measured on a 4-point scale with responses from 'never'

(1 score) to 'always' (4 scores). A total score of lifestyle modification behaviors was obtained by summing the response values across all 30 items, and the score looked up from 30-120. The content validity index (CVI) was performed by three experts and the value of CVI of this questionnaire was .80. The internal consistency reliability was applied to 30 subjects who met the same inclusion criteria of the study.

The descriptive data of LMBQ is presented in Table 4. The subscales consist of the following of items subscales such as dietary consumption (10 items), physical activity (5 items), avoiding risks (5 items), stress management (6 items), and seeking follow up (4 items). Most subscales had high internal consistency reliability, at determined by Cronbach's alpha coefficient. The Cronbach's alpha coefficient of LMBQ overall scale was .91.

3. Model of Goal-directed Behavior Questionnaire (MGBQ)

The Model of Goal-directed Behavior Questionnaire was developed by Taylor et al. (2005) based on the Theory of Planned Behavior (TPB), the Model of Goal-directed behavior (MGB) and previous studies (Ajzen, 1991; Bagozzi & Edwards, 1998; Perugini & Bagozzi, 2001). The MGBQ consisted of eight parts such as attitudes, subjective norms, perceived behavioral control, anticipated emotions, desire, intentions, past behavior, and trying. Only 5 parts of all parts in the MGBQ were selected to use in this study. These five parts consisted of all 14 items including attitude (3 items), perceived behavioral control (3 items), desire (2 items), intention (2 items), and trying (4 items). The internal consistency reliability was tested and accepted at .87 of total items of the MGBQ and the Cronbach's alpha coefficient in each part was between .75 and .95 (see Table 4).

Firstly, *attitude* was measured with three 5-point items with responses from very unpleasant (1 score) to very pleasant (5 scores), very bad (1 score) to very good (5 scores), and very unhappy (1 score) to very happy (5 scores). Attitude was assessed by 'considering all the effort and things, I would have to do to reduce (maintain) my blood pressure during the next 4 weeks (for example, exercising, dieting, monitoring my blood pressure, not smoking) and 'my overall attitude toward doing these things makes me feel ..' and The total score near 10 indicates a high attitude toward lifestyle modification behavior in hypertension.

PBC consisted of three items and was assessed about 'Please indicate how much control you have with regard to your blood pressure during the next 4 weeks'. PBC was measured on a 5-point scale which follow 'no control' (1 score) to 'total control' (5 scores) in two items and 'very difficult' (1 score) to 'very easy' (5 scores) in one item. The total score near 15 indicates high perceived behavioral control to adopt lifestyle modification behaviors in hypertension.

Desire was measured by two items which followed a 5-point scale from 'strongly disagree' (1 score) to 'strongly agree' (5 scores) in the first item and the second item uses five responses from 'no desire' (1 score) to 'strongly desire' (5 scores). The first item asks about 'I want to reduce (maintain) my blood pressure during the next four weeks.' The second asks patients to indicate their degree of desire in response to the following statement that is 'my desire to reduce (maintain) my blood pressure during the next four weeks can best be expressed as ...'. A total score near 10 indicates a high desire to adopt the lifestyle modification behavior for hypertension.

Intention was measured on a 5-point scale in two items with responses of strongly disagree (1 score) to strongly agree (5 scores) and assessed about 'I intend to reduce (maintain) my blood pressure during the next four weeks' and 'I plan to reduce (maintain) my blood pressure during the next four weeks'. The total score near 10 indicates a high intention to adopt lifestyle modification behaviors in hypertension.

Trying was measured by four items and asked about how hard did you try (to reduce/ maintain your blood pressure) during the past four weeks in each of the following senses: (1) devoting time for planning with respect to however you go about trying to reduce blood pressure, (2) expending a lot of mental/ physical energy to reduce (maintain) your blood pressure, (3) maintaining your will power to reduce (maintain) your blood pressure, and (4) sustaining your self-discipline to reduce (maintain) your blood pressure. It responded to on a five-point scale from 'not at all' (1 score) to 'extremely hard' (5 scores). The total score near 20 indicates high consistency trying to adopt lifestyle modification behavior in hypertension.

4. Illness identity scale

The Illness Identity Scale (Thai Version) was used to measure the illness identity in this study. This scale was a part of the Illness Perception Questionnaire (IPQ) which was developed base on Leventhal's Self-regulation model by Weinman et al. (1996). For Thai version, the IPQ was developed by Leelacharas (2005) for Thai patients with hypertension that composed of 12 items.

For this study, the Illness Identity Scale (Thai version) was modified by deleting some symptom items which was not presented clearly and frequently in adult with hypertension. Therefore, the scale was 5 items. Respondents are asked "Do

you think your high blood pressure causes you to experience the following symptoms?" and uses yes/no responses. The symptom items (s) of "yes" responses are given scores (1) and "no" was not given score (0). All given scores are summed for identity. The total score near 5 indicates high perception about symptoms and factors causing complications of hypertension. The content validity of the Illness Identity Scale was performed by three experts and the value of content validity index (CVI) of this questionnaire was .80. The internal consistency reliability was .77. (Table 4)

5. Hypertensive social support scale

Social support for hypertension was measured by the Hypertensive Social Support Scale which was developed by Pinprapapan et al. (2013). The scale measures about four types of social support including emotional support, instrumental support, informational support, and appraisal support which was based on the concept of social support by House (1981). The original scale consists of 20 items scoring from not true (score = 1) to strongly true (score = 4).

For this study, the original scale was added three items in order to follow the 7th and 8th Joint National Committee Hypertension guideline (James et al., 2014) and Thai Hypertension Society (2012) for adult with hypertension and changing words or sentences in some items. Therefore, the total items of the Hypertensive Social Support Scale were 23 items and the possible total scores can range from 23 to 92. The higher scores mean high social support for hypertension. The content validity of Hypertensive Social Support Scale was performed by three experts and the value of content validity index (CVI) of this questionnaire was 1.00.

The internal consistency reliability was accepted for this study which the Cronbach's alpha coefficient was .93. (Table 4)

6. Perceived self-efficacy about hypertension questionnaire

Self-efficacy was measure by the Perceived Self-Efficacy about Hypertension Questionnaire (HPSEQ) which was modified from the Self-Efficacy for Managing Chronic Disease 6-Item Scale (SES6C). The scale was developed by the Standard Patient Education Research Center (2012). It consists of 6 items which measures about how confident patients with chronic disease are in doing certain activities.

The content validity of HPSEQ was performed by three experts in this study. The value of CVI of this questionnaire was .80 and one item was deleted because the panel of experts suggested that it was not fit with hypertensive adult. Hence, the final version of HPSEQ consists of 5 items that are rated on a 5-point scale ranging from "not at all confident" (1 score) to "totally confident" (5 scores). Total scores were between 5 and 25. A total score near 25 indicates high confidence in a patient's ability to adopt lifestyle modification behaviors in hypertension. To examine the quality of instrument, the content validity of HPSEQ was performed by three experts and the value of content validity (CVI) of this questionnaire was .80. The internal consistency reliability accepted at .91 of the Cronbach's alpha coefficient (see the Table 4).

Table 4

Number of Items and Internal Consistency Reliability Scores of Questionnaires (n=30)

Measures	Number of items in scale	α
LMB overall scale	30	.91
- Dietary consumption	10	.88
- Physical activity	5	.75
- Avoiding risks	5	.82
- Stress management	6	.81
- Seeking follow up	4	.80
MGB	14	.87
- Attitude	3	.78
- Perceived Behavioral Control	3	.85
- Desire	2	.80
- Intention	2	.75
- Trying	4	.95
Social support	23	.93
Self-efficacy	5	.91
Illness identity	5	.77

Notes. LMB = lifestyle modification behaviors, MGB = Model of Goal-Directed Behavior

Translation of instruments

There were two questionnaires measuring MGB (including attitude, desire, perceived behavioral control, intention, and trying), and self-efficacy were developed in English language. To ensure the similarity between the original questionnaire and

the Thai language version, the researcher performed translation and back translation with the decentering technique. The process of the back-translation method with decentering is based on Brislin (1970, 1980 cited in Willgerodt, Kataoka-Yahiro, Kim, & Ceria, 2005). Basically, a back-translation method is to translate the original version into another language and to perform a retranslation into the original version afterward. For decentering, it involves developing equivalent or near-equivalent sentences that correspond to the sentences in the original source language and is accomplished by multiple rounds of translations. This idea is based on the assumption that the truth can be symmetrically translated that allows changing, modifying, or even adding items that are culturally appropriate (Polit & Beck, 2008).

According to the translation process, six translators who had experience and were experts in English as the main language were employed to translate the instruments. All six translators were a specialist in hypertension who used Thai and English languages effectively and a specialist in the context of Thai adults. An English native speaker was invited. Three steps of back translation with decentering method are following.

1. Translation step: Firstly, the process of the translation of the instruments was performed by using three bilingual translators for translation. The translator translated from the source language version questionnaire to the Thai language version questionnaire. All translators evaluated and selected the final Thai language version questionnaire together.

2. Back-translation step: At this second step, the three translators (back translators) blindly translated back from the Thai language version questionnaire to

the source language version questionnaire. After translation, all back translators evaluated semantic equivalence (the accuracy of using Thai language or the accuracy of word meanings) and content equivalence (the extent to which a construct holds similar meaning and relevance in two cultures) (Willgerodt, et al., 2005). The result was accepted when no errors are found in meaning and all three translators mutually agree that the final back-translated version questionnaire convey the same meaning. If the errors of back-translation step are found, it needs to go backwards to the first step.

3. Translation judgement step: A translator was an English native speaker who was an expert in the English language. The back-translated version questionnaire was compared with the source language version questionnaire by three translators. All translators checked the word meaning of the English and examined any distinction in meanings, resemblance of interpretation, and comparability of the language. If some items had problems such as some words had no meanings, translation step required. Thus, the consideration of this person confirmed that both versions have the same meaning and the Thai version has accuracy.

Validity and Reliability of Instruments

Validity

Prior to data collection, the modified questionnaires were examined for content validity, language suitability, and scoring criteria by three experts. The three experts consisted of two faculty educators and one advance practitioner nurse (APN) who were an expert and had experiences in adult with hypertension. The content validity was performed to ensure that the items in the questionnaires were sufficient to

measure all variables in this study. The panel of experts evaluated the questionnaires'
suitability to the related construction. The experts were asked to rate each item of the
instruments on a 4-point scale scoring from 1 (very irrelevant) to 4 (very relevant).
The content validity index (CVI) was used to determine and calculated by the
researcher. CVI was the proportion of items on an instrument that achieved a rating of
3 or 4 by all experts (Polit & Beck, 2006). Researcher used CVI information to guide
in revising, deleting, or substituting items. The adequate content validity index was
more than .80 (Waltz, Strickland, & Lenz, 2005). The experts gave some suggestions
to make the questionnaire fit into the research context and up to date such as deleting
one item in the SESC scale because it was not fit with patient with hypertension,
adding some items in the LMBQ in order to follow the JNC-7 and 8 guidelines, and
changing some words in the Hypertensive Social Support Scale to enhance
understanding for respondents.

Reliability

In this study, the internal consistency test for continuous research
instruments was examined using the Cronbach's alpha and the internal consistency
test for categorical instrument was evaluated using the Kuder-Richardson (KR 20). To
determine reliability of instrument, the reliability coefficient should be more than 0.80
for the existing instruments and more than .70 for the new instrument (Burns &
Groove, 2007). For preliminary study, the researcher included 30 subjects who meet
the same inclusion criteria of the study to conduct the reliability testing of all
instruments. The results of reliability testing were found that most of all instruments
had greater than .80 of Cronbach's alpha coefficient, excepting two parts of the MGB

questionnaire (including intention and attitude). Then, the researcher improved these two questionnaires by changing some words or some sentences from participants' feedback and tryout the two questionnaires in the same populations again until the reliability was accepted.

Data Collection

The process of data collection is divided in two stages such as;

1. Preparation stage: this stage started from the researcher asking for permission to perform the study from the Graduate School, approval from the Institutional Review Board of the Faculty of Nursing, Prince of Songkla University, permission to collect the data from the director of the studied hospitals, and approval from the Institutional Review Board of the studied hospitals was arranged prior to data collection.

2. Operational stage: To collect the data at the studied hospitals, the researcher informed the head nurse of the outpatient department who has responsibility in the hypertension clinic about the purposes of the study, the process of the study, sampling, data collection procedure, time frame, and participant's protection. At time of data collection, the researcher identified the participants from the personal medical records and selected participants who met the inclusion criteria. The researcher introduced herself and clearly explained the purposes of the research, its benefit and the right to refuse and discontinue participation to the participants; and asked for their consent to participate in the study.

Next, after the participants finished their follow-up appointment at the clinic, the participants were invited into a room and the environment was arranged to facilitate the participants in completing the questionnaires. The entire process for each participant was approximately 60 to 90 minutes. The questionnaires were recorded by participant's self-administration. If a participant could not read the questionnaires, the researcher facilitated to answer all questionnaires. Upon completion, participants directly returned the questionnaires to the researcher. Finally, after the participants finished all questionnaires, the researcher checked each completed questionnaire, obtained additional information, and thanked the participants for their participation.

Protection of Human Participants

The study was conducted after permission to perform the study from the Faculty of Graduate Studies, Prince of Songkla University, approval from the Institutional Review Board of the Faculty of Nursing, Prince of Songkla University, permission to collect the data from the director of the studied hospital, and the approval from the Institutional Review Board of the studied hospital had been granted. All participants in the study were informed about the purposes of the study, data collection procedure, and participants' right to decline or to withdraw from the study at anytime. Participants were informed that withdrawal would in no way affect their received care. The information was kept confidential, used only for the purposes of statistical analysis, and presented as a whole picture with the objective of extending the benefits of the study. Participants' names were not attached to the data. A code number was assigned to ensure confidentiality. Minimal risks such as fatigue and

emotional risk such as depressed or aggressive affecting from taking antihypertensive drugs might occur in some participants while they were completing the questionnaire. The researcher expressed concern and prevent, or deal with these problems by inform nurse who had responsibility at the clinic, separated participant from others for taking a rest, suggested his/her to relax and calm down until the participant ready to answer the questionnaire completely. While the participants were completing the questionnaires, the researcher was available to answer any questions they might have. The participants were informed that they could ask to complete the questionnaires at a later time. (Appendix C)

Data Analysis

Descriptive statistics, assumptions underlying path analysis, and testing research hypothesis were determined by using LISREL computer software (student version). Statistical significance was set a $p < .05$. Data analysis was performed as outlined in the following steps:

1. Data management

The researcher performed all data management procedures including coding, data entry, data screening, data cleaning, and data analysis. The researcher used a codebook to provide accuracy in coding, entered data and checked the data twice to validate the accuracy of the entry. Frequency distributions of the data of each variable were obtained to check for consistencies.

2. Preliminary data analysis

1) All data were ensured that there were no missing data and outliers before analysis. Missing data was defined as the respondents did not provide some information for several items in the research instruments. According to Tabachnick and Fidell (2007), missing data is a serious problem in the data analysis process, especially when the amount of missing data is more than five percent. The missing data pattern is more important than the amount of missing data (Schlomer, Baunam, & Card, 2010). In addition, outliers are extreme data which are numerically far from the other sample values (Tabachnick & Fidell, 2007).

In this study, missing data was checked during the process of data collection. Also, in order to check the outliers, the Mahalanobis distance were calculated using linear regression methods in IBM SPSS v23, followed by the computation of the Chi-square value. The multivariate outliers was detected using Mahalanobis distance which is at $p < .001$ indicating the presence of multivariate outliers (Tabachnick & Fidell, 2007). In addition, univariate outliers could be identified either through the visual inspection of the box plot, histograms, or frequency distributions. In this study, the univariate outliers were evaluated using box-plot. To deal with outliers, the use of transformations is the one means of accommodating outliers and one alternative to transformation is truncation method. For the truncation method, extreme scores are recoded to the highest (or lowest) reasonable score. This method would keep legitimate outliers and still not violating assumptions of data analyses (Osborne & Overbay, 2004).

2) To perform data screening, the frequencies of each variable were examined. Continuous data were summarized as a mean (M) and standard deviations (SD), depending on the normality distribution. Categorical data were presented as a frequency and percentage. Descriptive statistics including frequencies, percentages, means (M), and standard deviations (SD) were used to describe the demographic characteristics data such as individual characteristics and clinical data.

3) Evaluation of data for assumptions prior to using path analysis

Before further analyses, assumptions testing were performed in order to achieve assumptions of using path analysis. The assumptions were; level of measurement, normality, linearity, homoscedasticity, and independence of error.

3.1) Level of measurement was recommended that the dependent variable should be measured at the interval or ratio level and the independents variables can be measured at the nominal up to ratio level (Tabachnick & Fidell, 2007). It seems to be that all variables including in the model required interval level data. However, all selected variables in this study were ratio level.

3.2) Normality testing: Descriptive statistics including percentage, mean, standard deviation, skewness and kurtosis were used to describe the normality of variables. The distribution of independent variables and dependent variable should be of normal plot. Tabachnick and Fidell (2013) recommend that the data is normally distributed if the value of normality using Skewness and Kurtosis statistic should not be greater than 3 and 10. Also, Field (2009 cited in Ghasemi & Zahediasl, 2012) stated that the z-score of skewness and kurtosis uses a threshold ±2.58 indicating normal distribution in large samples (200 or more). To determine normality visually,

the frequency distribution (histogram) should be a bell shaped when the data are normal distribution. Furthermore, most researchers were suggested to test normality by Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk test; however, these two normality testing were sensitive to the size of sample that a large sample will be reported as significance indicating non-normal distribution (Ghasemi & Zahediasl, 2012; Wuensch, 2005).

To anticipate the problem of statistical analysis, lack of symmetry (skewness) and pointiness (kurtosis) was concerned. Tabachnick and Fidell (2007) and Howell (2007) suggested about guideline for transforming data when data is non-normal distribution in several transformation methods. If data distribution is moderately positive skewness or moderately negative skewness, square root transformation method will be used. Also, substantially positive skewness, substantially positive skewness with zero values, or substantially negative skewness is transformed by logarithmic transformation method. For this study, the researcher improved normality of data based on the Box-Cox transformation by using NCSS 11 (trial version) computer program. The Box-Cox transformation is a power transformation which incorporates and extends the traditional options to help researchers easily find the optimal normalizing transformation for each variable (Osborne 2010).

3.3) Independence of error: A common violation of this assumption occurs when each error term is related to its immediate predecessor (Tabachnick & Fidell, 2007). The Durbin-Watson statistic measures the autocorrelation of errors. The positive autocorrelation increases type I errors and makes the estimate of error

variance too small. The negative autocorrelation makes the estimate of error variance too large and results in the loss of power of significance. The expected Durbin-Watson value is approximately 2. The Durbin-Watson value close to 0 indicates strong positive autocorrelation, while the Durbin-Watson value close to 4 indicates strong negative autocorrelation (Munro, 2001).

3.4) Linearity testing: A linear relationship is one where increasing or decreasing one variable will cause a corresponding increase or decrease in the other variable too (Tabachnick & Fidell, 2007). The linearity testing could be determined by using bivariate scatterplots. The dependent variable against the independent variables and residuals will be inspected to assess linearity to provide a general estimate of linear relationship. The scatter plots presented that actual scores of each explanatory variable clustered around a predictable line indicating linearity.

3.5) Homoscedasticity is the condition in which "the variability in score for one continuous variable is roughly the same at all values of another continuous variable" (Tabachnick & Fidell, 2007). It is also known as the homogeneity of variance which means that the distribution of dependent variable scores should have equal variability for every value of independent variable scores (Munro, 2001). Assessment of the homoscedasticity could be done either by visually inspecting the bivariate scatterplots (Munro, 2001) or by checking the Levene's test result (Tabachnick & Fidell, 2007).

According to linearity and homoscedasticity testing, if the result of testing present that scatter plot is nonlinear and significant of Levene's test, the

problem of two testing can be solved like as asymmetric distributions (Prasith-rathasint, 2013; Polit, 1996).

3.6) Multicollinearity: Regarding to a problem of multicollinearity, it occurs when the correlations among predictors become too large and then the coefficients from multiple regression become unstable. Correlation matrix is used for testing multicollinearity or interrelationship among independent variables. According to Munro (2001), correlation as or above .85 indicates collinearity or multicollinearity among variables. Another testing for multicollinearity of all predictive variables in the model will be performed by two indices: tolerance and variance inflation (VIF). A tolerance, is simply $1-R^2$, can range from 0 to 1. VIF is inversely related to the tolerance value. A usual threshold of VIF value is 10. This value corresponds to a tolerance of 0.10 that indicate a high degree of collinearity or multicollinearity among the independent variables.

The problem of muliticollinearity can be solved by ridge regression, or ridge estimation technique (Prasith-rathasint, 2013; Maruyama, 1998). This approach can help deal with some cases where the correlations among predictors are large. Ridge estimation technique is attained by adding a small constant to the elements of the diagonal of the correlation matrix. Regression analyses could be used to exactly reproduce the correlation matrix (Prasith-rathasint, 2013; Polit, 1996).

4) To propose hypothesized model, some issues were concerned. For example, it assumes that variables in the model are measured without error (measurement error), the causal flow is in on direction (recursiveness), specification error and model identification (Polit, 1996: Maruyama, 1998).

4.1) Measurement error: the independent variables are measured without error to ensure unbiased parameter estimated (Polit, 1996). It will be evaluated using internal consistency method and the acceptable value of Cronbach's alpha test is more than .70 (Polit & Beck, 2008). Furthermore, Polit (1996) suggested that the greater the unreliability of the instruments used to measure variables in the analysis, the greater is the threat to validity of a multi-variate analysis. Thus, each variable requires an exact manifestation of the theoretical concepts underlying them and reasonably free of measurement error. Concerning about instrument properties such as validity and reliability can overcome a problem of measurement error.

4.2) Recursiveness: The model should be a recursive or unidirectional causal flow model (all the causal linkages flow in one direction and none of the variables represent both cause and effect at the same time). The correlation between independent variables and dependent variable in the model should be one-way flow (Polit, 1996), that is the causality in the hypothesized model has no feedback loops or bidirectional causality. If the model is nonrecursive model, the estimation can be done relatively simply by using ordinary least square (OLS) regression or maximum likelihood estimation (MLE) to solve the equations for each endogenous or outcome variable in the model (Lleras, 2005). In addition, variations on regression techniques such as indirect least squares, two-stage least squares, or three stage least squares could be used (Maruyama, 1998).

4.3) Specification error: This issue refers to be careful on selecting and specifying the research variables. The relevant variable should be included and the irrelevant variable should be omitted. The rationale of this assumption is that the

model captures only the reality. This issue can be detected based on the existing theory or evidence (Olobatuyi, 2006).

4.4) Model identification: According to Tabachnick and Fidell (2007), the first step in model identification is to count the number of data points and the number of unknown parameters. Data points are the number of variances and covariances. Unknown parameters are the number of regression coefficients, variances, and covariances that are estimated in a model. The next step in model identification is to compare between the number of data points and the number of parameters. There are three types of model identification (Maruyama, 1998; Tabachnick & Fidell, 2007; Munro, 2001).

First, the over identified model is defined as the number of data points is more than with unknown parameters. It caused by enough information to produce more estimates than parameters. For solving this model, regression has been presented to produce the best estimate by produce only a single solution for interrelating a set of predictors to a particular criterion variable (Maruyama, 1998). Also, circumstance least squares and maximum likelihood estimates are recommended.

The just-identified model that is the same number of data points as unknown parameters to estimate. It presented that all variables in the model are interconnected with each other by a path. Regression and linear algebra approaches yielded identical results (Maruyama, 1998). Just-identified model can become over-identified model through the process of "theory trimming" or the deletion of nonsignificant paths in the model (Munro, 2001). Also, just-identified model will

become under-identified model when the path is added and model becomes noncursive.

Last, the under-identified model occurs when the numbers of data points are less than unknown parameters because the information is not enough for estimation the parameters. This model cannot be solved. If their plausibility is of interest, the researcher need to be reconceptualized to make them identified (Maruyama, 1998). In a causal model study, the model should be over-identified (Tabachnick & Fidell, 2007).

5) The researcher tested the path analysis and the model fitting using LISREL computer program. The predictive power of the independent variables is presented as the coefficient of determination (R^2). The standardized path coefficient (β) uses to describe the influencing of each pair variable.

6) To ensure that the model was a best model, model selection was considered in this study. Burnham and Anderson (2004) mentioned that "Model selection should be based on a well-justified criterion of what is the "best" model, and that criterion should be based on a philosophy about models and model-based statistical inference, including the fact that the data are finite and noisy". The Akaike information criterion (AIC) and the Bayesian information criterion (BIC) were compared among set of models. Schreiber, Nora, Stage, Barlow, and King (2006) recommended that AIC and BIC are smaller the better.

7) For evaluating the goodness of fit of the model, the researcher proposed to relying on the following goodness of fit indices; a relative chi-square (χ^2/df) < 3 (Maruyama, 1998; Schreiber et al., 2006), goodness-of-fit index (GFI) $\geq$ .90

(Tabachnick &Fidell, 2007), comparative fit index (CFI) ≥ .90 (Munro, 2005), Non-Normed Fit Index (NNFI) ≥ .90 (Hair et al., 1998), root mean square error of approximation (RMSEA) < .06 (Hu & Bentler, 1999; Tabachnick & Fidell, 2007), and standardized root mean square residual (SRMR) ≤ .08 (Hu & Bentler, 1999; Schreiber et al., 2006). These fit indices were robust to sample size and model misspecifications (Hu & Bentler, 1999; Schermelleh-Eagle & Moosbrugger, 2003). These fit indices in this study were as follows:

7.1) The Relative Chi-square (χ^2/df): The chi-square test associated differences between observed data and a restricted structure resulting from the full model. A model with poor fit was indicated when the chi-square is large. Basically, in order to determine fit, the chi-square value (χ^2) should be compared with its associated degree of freedom (df). Chi-square relative to degree of freedom (χ^2/df) less than 3 was accepted for alternative indicator of goodness-of-fit (Maruyama, 1998; Schreiber et al., 2006).

7.2) Goodness of Fit Index (GFI): The GFI compared the squared residuals from prediction with the actual data. It represented the overall degree of fit ranging from 0 (poor fit) to 1 (perfect fit). Accocrding to Tabachnick and Fidell (2007), the goodness of fit index (GFI) should be greater than .90 that indicated good model fit. Higher values of GFI indicated better fit.

7.3) Adjusted Goodness of Fit Index (AGFI): The AGFI is an extension of the GFI, adjusted by the ratio of degree of freedom for the proposed model to null model. A recommended acceptance level is a value greater than or equal .90 (Tabachnick & Fidell, 2007).

7.4) Comparative Fit Index (CFI): The comparative fit index (CFI) assessed the comparison of fitness index between the target model and the initial model (Munro, 2005). The acceptable CFI value was more than .90 (Munro, 2005).

7.5) Root Mean Square Error of Approximation (RMSEA): The root mean square error of approximation (RMSEA) estimated the lack of fit in a model compared to a perfect model (Tabachnick & Fidell, 2007). In one word, The RMSEA explained about lack of fit of the model to population data, when parameters were optimally chosen (Byrne, 1998 cited in Hooper, Coughlan, and Mullen, 2008). A cut-off RMSEA value should less than .06 (Hu and Bentler, 1999; Tabachnick & Fidell, 2007).

7.6) Standardized Root Mean Square Residual (SRMR): The SRMR was the square root of the discrepancy between the sample covariance matrix and the model covariance matrix. The SRMR acceptable value was less than or at .08 (Hu and Bentler, 1999; Schreiber et al., 2006).

7.7) Non-Normed Fit Index (NNFI): The NNFI is quite similar with NFI. NFI analyzes the discrepancy between the chi-squared value of the hypothesized model and the chi-squared value of the null model. The NFI is very sensitive to sample size. NNFI is better than NFI because NNFI corrects the sample size sensitivity. The acceptable NNFI value is more than 0.90 (Hair et al., 1998).

8) The researcher interpreted the result of path analysis as following;

8.1) Reading the path diagram: After testing the proposed causal model has finished, the researcher interpreted the path test results. According to Munro (2001), path coefficients (β) represented the magnitude of the influence of one

variable on another in the path mode. The researcher should continue to put the path coefficient into the path diagram. The standardized (β) or the non-standardized (b) regression coefficient could be used as the value for the path coefficient. In addition, the researcher inspected the relationship between the independent variables and read the path coefficient for each pair carefully. Then, the researcher investigated the part of the dependent variable which cannot be explained by the independent variables and counted the value of both the countable and uncountable part of the dependent variable by the independent variables.

Based on assumed causal relationships, bivariate correlation between any two variables can be broken down into a series of effects: direct causal effects, indirect causal effects, and non-causal or spurious components (Polit, 1996). In path analysis, 3 types of causal effects were distinguished. Direct effect was the influence of one variable on another that is unmediated by any other variable (i.e. each single headed arrow represents a direct effect). An indirect effect was the amount of effect that is mediated by at least one intervening variable. Finally, the total causal effect was the sum of the direct and indirect effect in a model.

8.2) Interpretation of the table on path analysis output: After inserting the path coefficient (β) to the model, the researcher found out the multiple correlation coefficients (R) and the adjusted R^2 in the model summary table (Polit, 1996). The adjusted R^2 was the number of variance in the dependent variable that could be predicted by the variance of the independent variables (Munro, 2001). Then, the researcher should notice the correlation coefficients table. The researcher could find out the most important information in path analysis such as a constant, un-

standardized coefficient (b), standardized coefficient (β), t, significant level, and collinearity statistic.

8.3) Model modification: theory of trimming was often referred to for the process of dropping paths from a causal model (Polit, 1996). One criterion for trimming the model was the statistical significance of individual paths. The researcher looked at the statistical significance (*p*-value). Paths would be deleted from the model if the associated βs were not significantly different from zero. Another criterion was the meaningfulness of the path. With a large sample size, a β less than .05 has been suggested as one possible cutoff value for trimming a path. After that, the regression must be rerun because deletion of paths would result in changes to the βs for the retained paths. Thus, theory of trimming offered several advantages such as the development of a parsimonious causal explanation and the adequacy of the model. This process might be called a model modification. Besides, deletions and adding of paths should be based on theory or reasonable to explain causal relationships.

Chapter 4

Results and Discussion

This chapter presents the results of the data analysis and discussion in this study. The results are presented in four sections consisting of demographic data of the sample, testing assumptions, characteristics of explanatory and outcome variables, and hypothesis about lifestyle modification behaviors. The discussions are presented in two sections; personal characteristics and the research findings of the hypotheses.

Results

1. Demographic data of the participants

There were 240 participants in this study. The age of the participants varied from 35 to 59 years old with a mean age of 51.2 years (*SD* 7). Almost half of the participants (44.2%) were between 55 and 59 years old. About two-thirds of the sample was female (62.9%). The majority of the participants were married (80.4%). About third-fourths (76.7%) lived with their family which had 1 to 4 members. The majority of the participants (82.5%) were Buddhist. Half of the participants had completed elementary education (51.2%) whereas only 17.50 % had Bachelor degrees. Most participants (87.5%) had a job. About two-thirds had a monthly income less than 10,000 Baht. (See Table 5)

Table 5

Number, Percentage, Mean, and SD of the Participants by Individual Characteristics
(N = 240)

Individual Characteristics	N	%
Age (Years) *M* = 51.2, *SD* = 7, Min-Max = 35 - 59		
35 – 39	14	5.8
40 - 44	45	18.8
45 – 49	27	11.2
50 - 54	48	20.0
55 - 59	106	44.2
Gender		
Male	89	37.1
Female	151	62.9
Marital status		
Married	193	80.4
Single	27	11.3
Widow	14	5.8
Divorced	5	2.1
Separated	1	0.4
Family members (Persons) *M* = 3.4, *SD* = 1.5, Min-Max = 0-8		
None	2	0.8
1-4	184	76.7
5-8	54	22.5
Religion		
Buddhist	198	82.5
Muslim	42	17.5

Table 5 *(continued)*

Individual Characteristics	*N*	*%*
Highest education		
Elementary education (6 years)	123	51.2
Secondary education (9 years)	23	9.6
High school education (12 years)	33	13.8
Bachelor's degree	42	17.5
Master's degree	2	0.8
Vocational certificate	2	0.8
High vocational certificate	10	4.2
No education	5	2.1
Occupation		
Employee; unskilled laborer	84	35.0
Farmer	58	24.2
Government officer	39	16.2
Merchant; business owner	21	8.8
Business officer	7	2.9
Fisherman	1	0.4
Unemployed	30	12.5
Monthly income (Baht/month)		
$\leq 5{,}000$	53	22.1
5,001 – 10,000	91	37.9
10,001 – 20,000	52	21.7
20,001 – 30,000	29	12.1
30,001 – 40,000	8	3.3
$\geq 40{,}001$	7	2.9

Over half of the participants (54.2%) had been diagnosed with hypertension for less than 5 years, while only 5 % were diagnosed with hypertension for more than 15 years. The average blood pressure level at the time of data collection was about 134.40/79.13 mmHg. Only 20% of the participants had normal systolic blood pressure levels (less than 120 mmHg), where almost 70% of the participants had normal diastolic blood pressure (less than 80 mmHg). Moreover, more than half of the participants (51.2%) had comorbidities. The highest percentage of comorbidities was dyslipidemia (65%). Nearly half of the participants (48.3%) received 1 type of anti-hypertensive drug and about 50% of participants took drugs for treating their other diseases. About 73.3% of those participants had taken calcium channel blockers (CCBs) –dihydropyridines for reducing their blood pressure level. Two-fifths of the participants (41.2%) were recommended future follow ups from 9 to 12 weeks. About 97.1% of the participants received information about hypertension from health personnel. Also, more than half of the participants received information from hypertensive patients and family members (52.9% and 51.7%, respectively).

Table 6

Number, Percentage, Mean and SD of the Participants by Clinical Data (N = 240)

Clinical data	*N*	*%*
Years of being diagnosed with HTN *M* = 5.5, *SD* = 5, Min-Max = 0.5-26 years		
≤ 4 years	130	54.2
5-9 years	62	25.8
10-14 years	36	15.0
≥ 15 years	12	5.0
Previous blood pressure levels over a few visits	(*M*)	(*SD*)
1st time	143.12/82.39	18.11/9.98
2nd time	138.62/80.98	14.72/9.57
3rd time	135.83/80.30	15.81/10.45
Blood pressure level at time of data collection		
- Systolic BP *M* = 134.4, *SD* = 13.9, Min-Max = 90 – 190 mmHg		
Normal (< 120 mmHg)	20	8.4
Pre - HTN (120 - 139 mmHg)	138	57.5
Stage 1 HTN (140 - 159 mmHg)	68	28.3
Stage 2 HTN (≥ 160 mmHg)	14	5.8
- Diastolic BP *M* = 79.1, *SD* = 9.5, Min-Max = 51 – 110 mmHg		
Normal (< 80 mmHg)	160	66.7
Pre - HTN (80 - 89 mmHg)	32	13.3
Stage 1 HTN (90 - 99 mmHg)	40	16.7
Stage 2 HTN (≥ 100 mmHg)	8	3.3
Comorbidities		
No	117	48.8
Yes	123	51.2
- Dyslipidemia	80	65.0
- Diabetes Mellitus	22	17.9
- Respiratory disorders	13	10.6
- Heart disease	9	7.3
- Other (e.g. chronic kidney disease, gout, peptic ulcer, etc.)	20	16.2

Table 6 *(continued)*

Clinical data	*N*	*%*
Anti-hypertensive drugs		
1 type	116	48.3
2 types	88	36.7
≥ 3 types	36	15.0
Types of Anti-hypertensive drug		
- Calcium channel blockers (CCBs) - dihydropyridines	176	73.3
- Angiotensin-converting enzyme inhibitor (ACEI)	88	35.8
- Thiazide diuretics	57	23.8
- Angiotensin II antagonists	42	17.5
- β-blockers	37	15.4
- Other (e.g. α_1-blockers, CCBs-non dihydropyridines, loop diuretics)	18	7.5
Other drugs		
None	120	50.0
1 type	66	27.5
2 types	33	13.8
≥ 3 types	21	8.8
Future appointment recommended		
≤ 4 weeks	63	26.3
5 - 8 weeks	16	6.7
9 - 12 weeks	99	41.2
13 - 16 weeks	49	20.4
>16 weeks	13	5.4

Table 6 *(continued)*

Clinical data	*N*	*%*
Sources of knowledge about hypertension		
Health personnel	233	97.1
Hypertensive patients	127	52.9
Family members	124	51.7
Media (e.g. magazines, internet, social online network)	94	39.2
Friends	73	30.4

2. Testing assumptions

Evaluation of the data for assumptions prior to using path analysis was examined in this study. These were: 1) missing data and outliers; 2) normal distribution; 3) independence of error; 4) linearity testing; 5) homoscedasticity; and 6) multi-collinearity. (See Appendix E)

2.1 Missing data and outliers

The researcher checked the completeness of all the questionnaires after the participants had finished filling in the questionnaires and that the participants had not skipped any answers. Also, in regards to missing value analysis, the result of the Little's Missing Completely at Random (MCAR) test found that there were no missing values, so the test could not be computed. Thus, there was no missing data in this study. To check outliers, the distributions of explanatory and outcome variables were inspected by using Box-Plots. Four of the eight variables: attitude, desire, intention, and trying had outliers that were noteworthy or could be meaningful in future analyses. After using truncation transformation method for solving outliers, all four variables were without outliers (Figure E1).

2.2 Normal distribution

Normality testing among explanatory and outcome variables was inspected by using a) skewness, b) kurtosis, and c) the frequency distribution (histogram). The results found that three variables (e.g. attitude, intention, and illness identity) were non-normal distribution; whereas, the rest of the variables were normally distributed. Thus, the three variables were transformed by using the Box-Cox's transformation technique and retested normal distribution. The result of normality testing found that variables were normal (see Figure E2 and Table E1).

2.3 Independence of error

Multivariate analyses require that there is little or no autocorrelation in the data. To check this assumption, the Durbin-Watson's d testing was used for evaluating the autocorrelation of the errors in this study. The result presented that the Durbin-Watson value was 1.85 which was close to 2 indicating non-autocorrelation (Table E2). Thus, the assumption about independence of error was not violated.

2.4 Linearity testing

One way for the evaluation of the assumption of linearity testing in this study was using bivariate scatterplots. The result of scatter plots presented that actual scores of each explanatory variable clustered around a predictable line indicating linearity, and the scatter plot between the standardized residual value and the standardized predicted value indicated the existence of a linear relationship (Figure E3 and E4). Therefore, there was a linear relationship among the variables in this study.

2.5 Homoscedasticity

The researcher assessed homoscedasticity in two ways. Firstly, bivariate scatterplots of actual scores of each explanatory variable and outcome variable were similar. Secondly, in the Levene's test there were not meaningful differences in error variances between the explanatory and outcome variables (see Table E3). Thus, this assumption was not violated.

2.6 Multicollinearity

To examine whether or not the variables had multi-collinearity, a correlation matrix among the study variables, tolerance and variance inflation (VIF) were examined. In the correlation matrix among the explanatory and outcome variables, there were no correlations of 0.85 (Table 7). Thus, these correlations did not suggest multicollinearity. Also, there were no variance inflation (VIF) values of more than 10 in every single independent variable (see Table E4). Thus, these variables indicated that there was no multi-collinearity.

3. The relationships among explanatory variables and outcome variable

The Pearson's correlation among explanatory and outcome variables was presented in Table 7. All explanatory variables correlated with LMB, excepting trying. Social support and PBC had the strongest, positive relationship with LMB ($r = .52$ and .50, respectively). Self-efficacy and illness identity had a negative correlation with LMB ($r = -.13$ and -.27, respectively).

Table 7

Pearson's Correlation Matrix Among the Explanatory Variables and Lifestyle Modification Behaviors (N=240)

Variables	1	2	3	4	5	6	7	8	9
1. LMB	1								
2. Attitude	.40**	1							
3. PBC	.50**	.60**	1						
4. Desire	.28**	.50**	.49**	1					
5. Intention	.31**	.39**	.45**	.68**	1				
6. Trying	.09	.14*	.22**	.30**	.24**	1			
7. Social support	.52**	.40**	.35**	.31**	.30**	-.09	1		
8. Self - efficacy	-.13*	.04	-.04	.14*	.11	.47**	-.32**	1	
9. Illness identity	-.27**	-.21**	-.30**	-.16*	-.17*	.06	-.41**	.16*	1

Note. ** $p < .01$, * $p < .05$, LMB = Lifestyle modification behaviors, PBC = Perceived behavioral control

4. Hypothesis explaining lifestyle modification behaviors

4.1 Hypothesis 1

In hypothesis 1, the researcher proposed a model of eight explanatory variables that would explain or influence lifestyle modification behaviors.

4.1.1 Goodness of fit of the proposed model (or the first model)

A LISREL computer program was used to test the goodness of fit of the proposed model (or the first model). To accept a first model, the researcher found that the relative chi-square (χ^2/df) was greater than 3 and its *p*-value = .00 indicating the significance of the chi-square's test, the goodness of fit index was more than .90 (GFI=.94), the adjusted goodness of fit index was less than .90 (AGFI=.71),

the comparative fit index (CFI) was at .90, the non-normed fit index was less than .90 (NNFI = .61), the root mean square error of approximation (RMSEA=.18) was more than .06, and standardized root mean square residual (SRMR) was at .08. Five of the eight goodness indices of fit statistics indicated that the proposed model (the first model) did not fit with the empirical data.

4.1.2 Exploratory analyses for alternative explanatory model

Given that five of the eight goodness indices of fit values did not support the first model, exploratory analyses on an alternative model were conducted. The second model was proposed based on findings from model testing and what the researcher believed to be theoretically reasonable. The largest modification index (60.88) was from self-efficacy to trying which was expected to improve the model based on statistical findings from the modification indices. This path would be consistent with the social cognitive theory (SCT) by Bandura (1990) and Kelder et al. (2015) which stated that persons who feel a high level of self-efficacy are likely to put greater effort into tasks and be more persistent when obstacles occur.

The goodness of fit of the second model was examined and support was found for it. The relative chi-square was less than 3 (χ^2/df=1.90) and its p-value > .05, the goodness of fit index was more than .90 (GFI=.99), the comparative fit index (CFI) was at .99, the adjusted goodness of fit index was .90 (AGFI=.90), the non-normed fit index was less than .90 (NNFI = .75), the root mean square error of approximation (RMSEA) was .06, and standardized root mean square residual (SRMR) was at .02. However, some of the goodness of fit indices indicated that the second model did not fit well with the empirical data (Table 8).

To modify the second model, theory of trimming was done for the process of dropping paths from the model (Polit, 1996). Three paths including from 'illness identity', 'self-efficacy' 'attitude' to 'LMB' was deleted from the revised model because the associated βs were not significantly different from zero. Furthermore, the second model was improved based on what the researcher believed to be theoretically reasonable. Based on the Model of Goal-directed Behavior, Perugini and Bagozzi (2001) stated that desire serves as essential mediators between attitude and perceived behavioral control (PBC). Thus, two paths were added from 'attitude' to 'desire' and from 'PBC' to 'desire'. Also, adding a path from 'attitude' to 'PBC' was assumed to improve the model because attitude reflects the personal belief to perform behavior. When persons had positive attitude, they tend to perceive ease of performing the behavior and could control themselves to act.

Moreover, three paths from 'social support' to 'desire', 'social support' to 'intention', and self-efficacy to 'desire' were added. Social support influences the process of decision making to perform behavior (Leelacharas, 2005; Purateeranrath, 2011) and self-efficacy can influence thought patterns to do activities (Baandura, 1991 cited in Ajzen, 1991). The support from surrounding people and the high level of self-efficacy would help and motivate him or her to form desire and intention. Also, a path from 'illness identity' to 'PBC' was added in the second model because the symptom was a condition to impede to perform behavior (Leventhal et al., 2003). When person had high level illness identity, they might decrease ability to control themselves.

The goodness of fit of the final model was examined and support was found for it. The relative chi-square was less than 3 (χ^2/df= 0.95) and its *p*-value > .05, the goodness of fit index was more than .90 (GFI=.99), the adjusted goodness of fit index was more than .90 (AGFI=.96), the comparative fit index (CFI) was at 1.00, the non-normed fit index was more than .90 (NNFI = 1.00), the root mean square error of approximation (RMSEA) was 0.00, and standardized root mean square residual (SRMR) was at .03. All of the goodness of fit indices and the p-value indicated that the final model fitted well with the empirical data (Table 8). Thus, the researcher chose the final model rather than the first and second model.

Table 8

Model Fit Statistics of the Proposed (First), Second, and Final Model (N=240)

Test statistics	Values			Criteria of goodness of fit values
	1st Model	2nd Model	Final Model	
χ^2/df	8.45	1.90	0.95	< 3 (Maruyama, 1998; Schreiber et al., 2006)
p-value	.00	.06	.51	*p*-value ≥ .01 indicating non-significance of chi-square's test (Schermelleh-Eagle & Moosbrugger, 2003)
GFI	.94	.99	.99	≥ .90 (Tabachnick & Fidell, 2007)
AGFI	.71	.90	.96	≥ .90 (Tabachnick & Fidell, 2007)
CFI	.90	.99	1.00	≥ .90 (Munro, 2005)
NNFI	.61	.75	1.00	≥ .90 (Hair et al., 1998).
RMSEA	.18	.06	.00	< .06 acceptable fit (Hu & Bentler, 1999; Tabachnick & Fidell, 2007)
SRMR	.08	.02	.03	≤ .08 acceptable fit (Hu & Bentler, 1999; Schreiber et al., 2006)

Note. χ^2/df = Relative Chi-square, Goodness of Fit Index (GFI), AGFI = Adjusted Goodness of Fit Index, CFI=Comparative Fit Index, NNFI = Non-Normed Fit Index, RMSEA=Root Mean Square Error of Approximation (RMSEA), SRMR=Standardized Root Mean Square Residual (SRMR)

4.1.3 Findings from the final model

Perceived behavioral control (PBC) and social support had positive direct influences on lifestyle modification behaviors (β = .33, *p* < .001; β = .38, *p* < .001, respectively). These two explanatory variables of PBC and social support accounted for 38% of the total variance in lifestyle modification behaviors. However, intention, trying, attitude, self-efficacy, and illness identity did not have direct influences on lifestyle modification behaviors.

Desire, social support, and PBC had positive and direct influences on intention (β =.54, *p* < .001; β =.11, *p* < .05; β =.18, *p* < .01, respectively). These three explanatory variables accounted for 47% of the total variance in intention. Also, self-efficacy, intention, and PBC had positive and direct influences on trying (β = .46, *p* < .001; β = .18, *p* < .01; β =.18, *p* < .05, respectively). These three variables accounted for 30% of the total variance in trying.

Moreover, attitude, social support, self-efficacy, and PBC had positive and direct influences on desire (β =.26, *p* < .001; β =.17, *p* < .001; β =.20, *p* < .001; β =.29, *p* < .001, respectively). About 35% of the total variance in desire was explained by all four explanatory variables including attitude, social support, self-efficacy, and PBC. In addition, attitude and illness identity had direct influences on PBC (β =.56, *p* < .001; β = -.18, *p* < .001, respectively). These two explanatory variables accounted for 39% of the total variance in PBC. (Table 9 and Figure 7)

Table 9

Path Analyses Results for the Final Model (N=240)

Variables		R^2	β	SE	t
LMB		.38			
	Intention		.06	0.91	1.02
	Trying		.04	0.24	0.68
	PBC		.33	0.43	5.57***
	Social support		.38	0.05	6.89***
Intention		.47			
	Desire		.54	0.05	9.77***
	Social support		.11	0.00	2.14*
	PBC		.18	0.03	3.24**
Trying		.30			
	Intention		.18	0.21	2.97**
	PBC		.18	0.10	2.35*
	Self-efficacy		.46	0.03	8.35***
Desire		.35			
	Attitude		.26	0.04	3.67***
	Social support		.17	0.01	2.73**
	Self-efficacy		.20	0.01	3.49**
	PBC		.29	0.04	4.35**
PBC		.39			
	Attitude		.56	0.06	10.82***
	Illness identity		-.18	0.06	-3.54**

Note. SE=Standard error, LMB=Lifestyle modification behaviors, PBC = Perceived behavioral control, *$p < .05$, **$p < .01$, ***$p < .001$
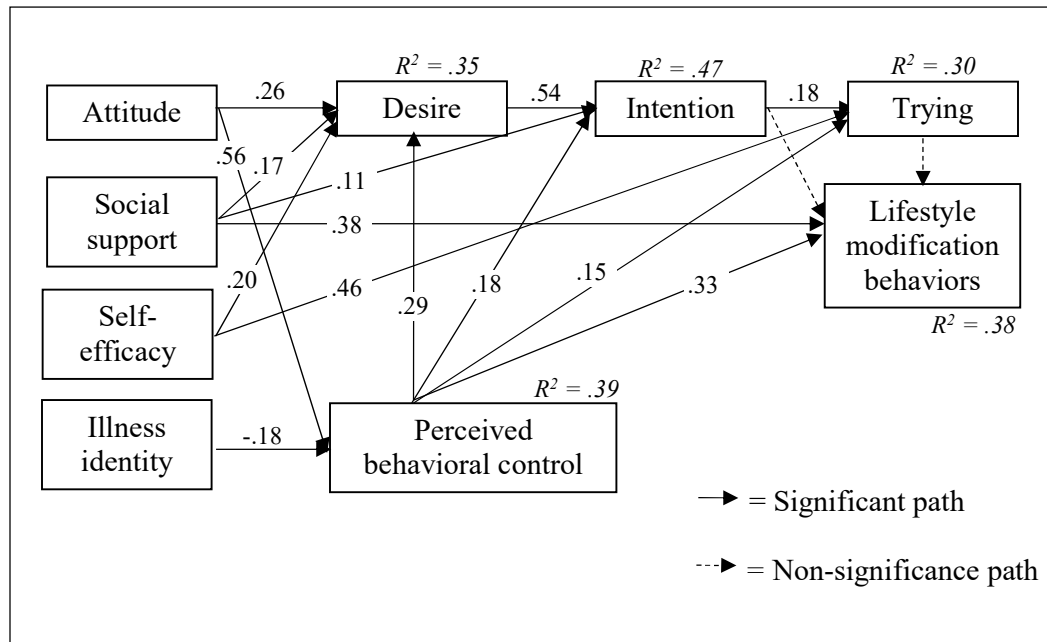
Figure 7. A Final Model of Lifestyle Modification Behaviors in Thai Adults with HTN. *Note.* Model fit indices: χ^2/df = .95; *p*-value = .51; GFI = .99; AGFI = .99; CFI = 1.00; NNFI = 1.00; RSMEA = .00; SRMR = .03.

4.2 Hypothesis 2

Hypothesis 2 proposed that 2a) intention would have positive and direct influences on trying and lifestyle modification behaviors and 2b) intention would have positive and indirect influences on lifestyle modification behaviors via trying.

The β for intention had a positive and direct influence on trying (.18, *p* < .01); however, it did not have a significance direct influence on lifestyle modification behaviors. Thus, hypothesis 2a was partially supported. Because intention did not have an indirect influence on lifestyle modification behaviors through trying, hypothesis 2b was not supported. (See Table 10)

4.3 Hypothesis 3

Hypothesis 3 proposed that trying would have a positive and direct influence on lifestyle modification behaviors. The finding presented that trying did not have a significance direct influence on lifestyle modification behaviors, so the third hypothesis was not supported (Table 10).

4.4 Hypothesis 4

Hypothesis 4 proposed that 4a) desire would have a positive and direct influence on intention, and 4b) desire would have a positive and indirect influence on trying and lifestyle modification behaviors through intention.

As seen in Table 10, hypothesis 4a was supported. Desire affected intention positively and directly ($\beta = .54$, $p < .001$). In hypothesis 4b, desire had a positive and indirect influence on trying through intention ($\beta = .10$, $p < 0.05$), however it did not have a significant indirect influence on lifestyle modification behaviors via intention. Hypothesis 4b was partially supported. (Table 10)

4.5 Hypothesis 5

Hypothesis 5 proposed that 5a) attitude would have a positive and direct influence on intention and lifestyle modification behaviors, and 5b) attitude would have a positive and indirect influence on trying and lifestyle modification behaviors through intention. The finding presented that attitude did not influence intention, trying, and lifestyle modification behaviors (Table 10). Hypotheses 5a and 5b were not supported.

After model modification, the final model presented that attitude directly and positively affected desire ($\beta = .26$, $p < 0.001$) and PBC ($\beta = .56$,

$p < 0.001$). Also, attitude had indirect influences on desire, intention, trying, and LMB ($\beta = .16$, $p < 0.01$, $\beta = .32$, $p < 0.001$, $\beta = .14$, $p < 0.01$, and $\beta = .21$, $p < 0.001$, respectively).

4.6 Hypothesis 6

Hypothesis 6 proposed that 6a) perceived behavioral control (PBC) would have a positive and direct influence on intention, trying, and lifestyle modification behaviors, and 6b) PBC would have a positive and indirect influence on trying and lifestyle modification behaviors through intention and trying.

As seen in Table 10, PBC had positive and direct influences on intention ($\beta = .18$, $p < .01$), trying ($\beta = .15$, $p < .05$), and on lifestyle modification behaviors ($\beta = .33$, $p < .001$). After model modification, the final model presented that PBC had a positive and direct influence on desire ($\beta = .29$, $p < .001$). Thus, hypothesis 6a was supported. Moreover, PBC indirectly affected trying and intention ($\beta = .06$, $p < .05$ and $\beta = .15$, $p < 0.01$, respectively). PBC did not have an indirect influence on lifestyle modification behaviors. Hypothesis 6b was partially supported.

4.7 Hypothesis 7

Hypothesis 7 proposed that self-efficacy would have a positive and direct influence on lifestyle modification behaviors. Self-efficacy did not influence lifestyle modification behaviors directly (Table 10). After model modification, self-efficacy had a positive and direct influence on trying ($\beta = .46$, $p < .001$). Self-efficacy also affected desire positively and directly ($\beta = .20$, $p < .01$). In addition, self-efficacy had positive and indirect influences on intention and trying ($\beta = .11$, $p < .01$ and $\beta = .02$, $p < .05$). Hypothesis 7 was partially supported.

4.8 Hypothesis 8

Hypothesis 8 proposed that social support for hypertension would have a positive, direct influence on lifestyle modification behaviors. As seen in Table 10, social support affected lifestyle modification behaviors, intention, and desire directly and positively ($\beta = .38$, $p < .001$, $\beta = .11$, $p < .05$, and $\beta = .17$, $p < .01$, respectively) after modifying model. Also, social support had positive and indirect influences on intention and trying ($\beta = .09$, $p < .05$ and $\beta = .04$, $p < .05$). Thus, hypothesis 8 was partially supported.

4.9 Hypothesis 9

Hypothesis 9 proposed that illness identity would have a negative and direct influence on lifestyle modification behaviors. As seen in Table 10, illness identity did not have a significant direct influence on lifestyle modification behaviors. However, after the proposed model was modified, illness identity had a negative and direct influence on PBC ($\beta = -.18$, $p < .01$) and it had negative and indirect influences on LMB, intention, trying, and desire ($\beta = -.07$, $p < .01$, $\beta = .06$, $p < .01$, $\beta = -.04$, $p < .05$, and $\beta = -.05$, $p < .05$, respectively). Therefore, this hypothesis was partially supported.

Table 10

Total, Indirect, and Direct Effects in the Final Model

Variables	LMB			Intention			Trying			Desire			PBC		
	IE	DE	TE	IE	DE	TE	IE	DE	TE	IE	DE	TE	IE	DE	TE
Int	.01	.06	.07	-	-	-	-	.18[b]	.18[b]	-	-	-	-	-	-
Try	-	.04	.04	-	-	-	-	-	-	-	-	-	-	-	-
Att	.21[c]	-	.21[c]	.32[c]	-	.32[c]	.14[b]	-	.14[b]	.16[b]	.26[c]	.42[c]	-	.56[c]	.56[c]
PBC	.03	.33[c]	.36[c]	.15[b]	.18[b]	.33[c]	.06[a]	.15[a]	.21[b]	-	.29[b]	.29[b]	-	-	-
SE	.02	-	.02	.11[b]	-	.11[b]	.02[a]	.46[c]	.48[c]	-	.20[b]	.20[b]	-	-	-
SS	.01	.38[c]	.40[c]	.09[a]	.11[a]	.20[b]	.04[a]	-	.04[a]	-	.17[b]	.17[b]	-	-	-
II	-.07[b]	-	-.07[b]	-.06[b]	-	-.06[b]	-.04[a]	-	-.04[a]	-.05[a]	-	-.05[a]	-	-.18[b]	-.18[b]
De	.04	-	.04	-	.54[c]	.54[c]	.10[a]	-	.10[a]	-	-	-	-	-	-

Note. [a] $p < .05$, [b] $p < .01$, [c] $p < .001$; LMB = Lifestyle modification behaviors; PBC = Perceived behavioral control; Int = Intention; Try = Trying; Att = Attitude; SE = Self-efficacy; SS = Social support; II = Illness identity; De = Desire; TE = Total effects; IE = Indirect Effects; DE = Direct Effects

Discussion

The discussion on the findings is presented in the following two sections 1) personal characteristics and 2) the research findings of the hypotheses.

1. Personal characteristics

1.1 Individual information

The age of the participants varied from 35 to 59 years old with a mean age of 51.2 years and almost half of the sample (44.2 %) were between 55 and 59 years old. The age range in this study was similar to the report from the Bureau of Epidemiology in Thailand which presented that the highest number of Thai people with HTN in 2012 was between 50 and 59 years old in the adult age group (Thonghong et al., 2013). Also, this finding was consistent with the Pinprapapan's study (2013) which reported that almost half of the participants with HTN were found to be from 51 to 59 years old. Perhaps, the risk of hypertension increases with age due

to a stiffening of the blood vessels (WHO, 2013).Thus, the prevalence of HTN is usually found in this age group.

Moreover, about two-thirds of the participants were female (62.9%). This finding was consistent with several previous findings. The Annual Report 2015 from the Bureau of Non-Communicable Disease Thailand, (2016) revealed that the prevalence rates of adults with HTN were found 16.6 in females and 13.7 in males. The Chronic Diseases Surveillance Report in Thailand (Thonghong et al., 2013) found that the proportion of females who were diagnosed with hypertension was 1.70 times higher than males with hypertension in 2012. Also, Chongthawonsatid (2014) revealed that females were 1.48 times more likely to be diagnosed with HTN than males. Sunsern et al. (2011) conducted the study in one province of Thailand and they revealed that nearly three-fourths of the participants who had HTN were female.

The majority of the participants were married (80.4%) and three-fourths lived with their family which had 1 to 4 members (76.7%). The finding was not surprising because Thai people most often lived in an extended family, particularly in rural areas. Thai families are brought up to have close family ties and to respect adults or the elderly, thus when a family member suffers from an illness he or she will seek help and care from their family first (Purateeranrath, 2011) and family members would take care of the patients as a caregiver (Nilchaikovit et al., 1993). Thus, family was central to a Thai person's life. Similarly, Pinprapapan's study (2013) found that most participants were married and living with family members such as spouse, children, and parents.

Increasing lifestyle modification behaviors among adults with HTN may depend on having a high education level. Education could enable people to understand issues which relate to a target behavior. When a person has a high level of education, they are motivated to act, and have the skills and abilities to solve or prevent problems from behavior changing (Monroe, n.d.), as lifestyle modification behaviors. The study by Agyemang, Valkengoed, Koopmans, and Stronks (2006) found that high education levels and physical activity were associated with better BP control among the Dutch hypertensive persons. Nonetheless, only 20% of participants in this study had a Bachelor degree and post graduate degree. Half of the participants had completed elementary education (51.2%). These findings are the same as previous studies in Thailand. The Annual Report 2015 from the Bureau of Non-Communicable Disease Thailand, (2016) reported that the highest prevalence rate of adults with HTN was found in participants who had completed elementary education or had no education. A previous study by Mukda (2012) examined knowledge and practice of HTN self- care in patients with HTN, the finding reported that an elementary level of education was the highest education level among participants with HTN (> 90%). Pinprapapan's study (2013) found that the highest education level among participants was elementary school, and this was in about three-fourths of the participants.

According to WHO (2013), unemployment or fear of unemployment may have an impact on stress levels that influences high blood pressure or the risk of hypertension increases with age due to a stiffening of the blood vessels. This finding showed that 87.5% of participants had a job and two-thirds of the participants had a

monthly income less than 10,000 baht. The finding was less than the average monthly income of Thais in 2015 which was 26,915 baht (National Statistical Office, 2016). Although most participants were employees, working stress was a risk factor which had an influence on raised blood pressure and adopting lifestyle modification behaviors, particularly in the middle-low income group. The finding was similar with Pinprapapan's study (2013) which found that more than 80% of participants earned an income less than 10,000 baht.

1.2 Clinical information

Experience with HTN may influence lifestyle modification behaviors. Over half of the participants had been diagnosed with hypertension for less than 5 years (54.2%, M = 5.5 years). It is possible that the participants in this study were in the working aged-group. Due to job and household responsibilities, they may have delayed screening for their blood pressure levels and receiving treatment. Also, HTN is an asymptomatic disease, so it is more difficult to detect. Thus, the finding may have resulted from these reasons. This finding corresponded with the previous studies. Mukda (2012) found that more than half of the participants had lived with HTN for less than five years. Also, Guddad, Malagi, Kasturiba, and Hasabi (2012) reported that the majority of their participants had suffered from HTN for 1-5 years. The average duration of being diagnosed with HTN was 3.79 years among women with HTN in Pinprapapan's (2013) study.

In addition, two-fifths of participants (41.2%) in this study were recommended future follow ups from 9 to 12 weeks (4-5 times/year). This is consistent with the Thai Guideline on the treatment of Hypertension 2015 (Thai

Hypertension Society, 2015), in that they recommend that a patient who has blood pressure levels between 140-159 mmHg and 90-99 mmHg should follow up to check their HTN disease at least every two months (8 weeks). Similarly, Vichitsoonthornkul (2015 cited in the Annual Report 2015 from the Bureau of Non-Communicable Disease Thailand, 2016) reported that more than one-third of adults with HTN (32.90%) followed up at a hypertension clinic around 3-4 times/year.

In consideration to blood pressure levels at the time of data collection, more than 90% of participants had high systolic blood pressure levels which showed that more than one-third of them were stage 1 and 2 HTN (34.2%). Moreover, more than 30% of the participants had high diastolic blood pressure which meant more than two-thirds of them were stage 1 and 2 HTN. These findings are consistent with several reports about uncontrolled HTN in Thailand. The Medical Research Network of the Consortium of Thai Medical Schools (2015 cited in the Annual Report 2015 from the Bureau of Non-Communicable Disease Thailand, 2016) reported that adults with HTN who could control blood pressure levels continuously (at least two times) was only 41.50 % in 2015 which had decreased from 42.70% in 2014. Also, Pangjunant and Panthuvaj (2015) reported that more than two-thirds of Thai adults with hypertension who were prescribed medications had their HTN uncontrolled.

In addition, more than half of the participants (51.2%) had comorbidities and the highest percentage of comorbidities was dyslipidemia (65%). The finding was consistent with WHO (2013) which mentioned that high cholesterol is an important factor which causes complications of HTN. Also, Dalal et al. (2012) stated that dyslipidemia causes endothelial damage and loss of physiological

vasomotor activity. This damage may manifest as elevated systemic blood pressure (BP). The study by Pakdeepinit, Kaewklin, and Khongchin (2016) reported that a half of the patients with HTN usually consumed unhealthy diets that contained foods such as fatty foods. Thus, half of the participants in this study had disease complications such as dyslipidemia.

Moreover, most participants (97.1%) received information about hypertension from the health care team. This finding supports the Annual Report 2015 from the Bureau of Non-Communicable Disease, Thailand (2016). The report revealed that nearly 80% of patients who followed up at hospital, received information about their disease every time. Possibly, a nurse or other health professionals are a key person who has an important role to promote lifestyle modification behaviors in adults with hypertension. Focusing on the nurse, the nurse's roles in case manager in chronic care (including hypertension) are established by Thailand Nursing and Midwifery Council and National Health Security Office (Sindhu, 2013); for example, nurses will advocate that clients who are on antihypertensive treatment, receive appropriate follow-up, in collaboration with the healthcare team, and will document and share comprehensive information regarding hypertension management with the client and healthcare team. Thus, it is not surprising that the highest percentage of receiving HTN information came from the health care personnel.

2. The research findings of the hypotheses

2.1 The model fit

The researcher examined a proposed causal model of lifestyle modification behaviors among Thai adults with HTN. The model was based partly on empirical evidence. In adults with hypertension, trying, social support, self-efficacy and illness identity were shown to explain LMB. In addition, the researcher developed the model partly on the Model of Goal-Directed Behavior (MGB). Some variables of MGB that were attitude, desire, perceived behavioral control, and intention, had strong significant influences on lifestyle behaviors in previous researches with the HTN population. The model of lifestyle modification behaviors was proposed by combining some variables from MGB and some empirical studies in Thai context. No previous studies examined the set of relationships among these variables and how this set of variables explained LMB among adults with HTN.

The final model in this study explained 38% of the variance in the lifestyle modification behaviors, 30% of the variance in trying, 47% of the variance in intention, 35% of the variance in desire, and 39% of the variance in PBC. A study by Taylor et al. found 56% (for men) and 50% (for women) of variance in trying, 88% (for men) and 67% (for women) of variance in intention, and 46% (for men) and 30% (for women) of variance in desire, respectively. Although the percentage of the variance in intention and trying in this study was similar to the previous model, the researcher could not claim that this finding is the same as the previous model because there was a difference of dependent variable and the researcher did not examine all the variables from MGB, as in the previous model.

Several goodness of fit values did not support the proposed model which indicated that the proposed model was not the best fitting model with the empirical data. Some goodness-of-fit values did not meet the acceptable criteria such as significance of the chi-square tests and RMSEA higher than .06; however, the majority of fit indices indicated that these four initial models fit with the empirical data (CFI $\geq$ .90, NNFI $\geq$ .90, SRMR $\geq$ .08, and the relative chi-square (χ^2/df) $\leq$ 3). The proposed model of this study was not consistent with Taylor's study (2005) in which all four initial models based on MGB supported the fit of the model.

According to the three previous models which were not guided by MGB, a previous model in Taiwan by Chen et al. (2011) was developed based on the Common-Sense Model (CSM) and empirical studies for adherence to therapeutic regimens in adults with HTN. Chen's study found that the initial model did not fit with empirical data indicating the poor goodness-of-fit indices, thus they modified and found a better model fit. In Korea, a study carried out by Yang et al. (2010) proposed a model of blood pressure control in Korean hypertensive adults based on empirical studies and they found that their final model fitted with the empirical data. However, they did not mention the goodness-of-fit values of the hypothesized model and the model modification. Another model was examined by Pinprapapan et al. (2013) who proposed the causal model of adherence to therapeutic regimens (ATR) among Thais with hypertension which was developed from empirical evidence. Their hypothesized model did not fit with the actual data, so they modified their model until it fitted the data well.

In the process of model modification, the proposed model in this study was modified based on findings from the prior model testing and theoretical reasons. From statistical suggestion, the largest modification index (MI) was from self-efficacy to trying. Because this parameter was meaningful and theoretically sound, a direct path from self-efficacy to trying was added to modify the proposed model. Moreover, some paths were trimmed from the proposed model because of being non-significant paths, and also some paths were added to the proposed model following theoretical framework. Thus, the final model in this study consisted of 16 paths. There was no reports regarding the model modification process in previous model based on MGB (Taylor et al., 2005). Besides MGB, Pinprapapan et al. (2013) modified their proposed model by deleting three paths which were not significant and had negative directions, and they added one path which improved the indices for a goodness-of-fit. The initial model by Chen et al. (2011) was revised by adding additional paths.

In this study, the researcher re-evaluated the final model after modifying model. The finding of goodness-of-fit values presented that all values met the criteria, thus the final model fitted well with the empirical data. Only two studies (Pinprapapan et al., 2013; Chen et al., 2011) reported the model modification process and the goodness-of-fit values of the final model in adults with HTN. After deleting and adding some paths in the revision of the ATR model, Pinprapapan et al. (2013) re-tested the model and found an adequate fit with the data. All fit indices presented the best fit (including GFI = 1.00 and RMSEA = .00). The study by Chen et al. (2011) showed a satisfactory goodness-of-fit indices (GFI = .94 and RMSEA = .05) after modifying the proposed model by adding some paths.

Based on MGB, there were similarities and differences between this study and previous study (Taylor et al., 2005). In regards to differences, the previous studies tested all the variables from MGB, while this study selected some variables which were powerful predictors to the proposed model. Four variables from MGB (attitude, desire, perceived behavioral control, and intention) were used in this study which is the same as in both of the previous studies. Moreover, there were differences between the previous study and this study. Although trying was added by the researchers in previous models and this study, it was examined in different functions. Whereas the prior researchers evaluated the theoretical explanations from the Model of Goal-Directed Behavior (MGB) with "Trying" as the outcome, "Behavior" was used instead in this study. Behavior is a preferred outcome measure. In addition, both of the previous studies had two mediating variables, that were desire and intention, but this study included PBC, desire, intention, and trying.

Another difference was that this study selected some explanatory variables which were based on empirical evidence and Thai cultural context such as social support, self-efficacy, and illness identity. This study had one proposed model (Figure 1), while Taylor et al.'s (2005) study had four hypothesized models; in men, women, maintainers, and reducers. Thus, this study is the first to examine MGB and empirical research to explain lifestyle modification behaviors (LMB) in Thai adults with hypertension.

In the final model, this study had 14 significant paths and 2 non-significant paths. The two non-significant paths were intention on LMB and trying on LMB. Taylor et al.'s (2005) study had 12 proposed paths and they found 8 significant

paths for men, 5 significant paths for women, 5 significant paths for maintainers, and 7 significant paths for reducers.

Desire was found to be a powerful magnitude path in three studies. Taylor et al.'s study found that desire was the strongest influence on intention in both genders (men and women) and goal-type (maintainers and reducers). A study by Baghianimoghadam et al. (2011) guiding by the MGB revealed that desire was the second strongest influence on intention Similarly, desire was the second strongest influence on intention in this study ($\beta = .54$, $p < .001$). Therefore, desire had a strong and positive influence on intention as the same two previous studies.

Furthermore, PBC was the one variable which had direct and positive influences on desire, intention, trying, and LMB in this study. It had low to moderate magnitude paths ($\beta = .15 - 33$). Differently, PBC affected intention and trying in Baghianimoghadam et al.'s (2011) study. The Taylor et al.'s study revealed that PBC had direct and positive influences on intention (for maintainers and reducers). Moreover, this study and two previous studies had two similar variables which had a positive influence on trying (including intention and PBC).

Based on the MGB, this study had a low magnitude path from PBC to trying ($\beta = .15$, $p < .05$). Perhaps, persons who had just been diagnosed with HTN received new information about the treatment of HTN such as lifestyle modification behaviors. For this study, more than half of the participants were diagnosed with HTN for less than 5 years, and most of the participants received suggestions for controlling their blood pressure levels from health care personnel. Increasing PBC could be formed by internal factors (e.g. knowledge, skills, will-power) and external factors

(e.g. time, availability, the cooperation of others) (Ajzen & Madden, 1986). When the participants had PBC sufficiency, they tried to perform lifestyle modification behaviors for HTN. However, more than 80% of the participants had a job and the one-third of the participants was a labor. Responsibility for their work and family would be one factor which decreased the level of PBC. Thus, PBC had a low influence on trying for LMB.

2.2 Influences of intention on lifestyle modification behaviors

The second hypothesis examined direct and indirect influences of intention on lifestyle modification behaviors. The final model presented that intention did not influence on lifestyle modification behaviors. The association between intention and lifestyle modification behaviors was inconsistent with theory and previous studies. A previous study conducted in African American adults by Peters and Templin (2010) who proposed their model based on the theory of planned behavior (TPB) found that adults who had a history of hypertension were likely to intend to engage in recommended BP control behaviors. The possible reasons for the inconsistency are explained as follows.

In this study, almost half of the participants were diagnosed with HTN for more than 4 years (45.8%) and they had well-control blood pressure levels (M = 134.40/79.13 mmHg at the time of data collection). Possibly, persons who had more experience with HTN and had been successful in controlling blood pressure by themselves, may have had low intentions to adopt lifestyle modification behaviors. Experience in performing behaviors may create habits in a person resulting in a

decreasing importance of intention to determine behavioral performance (Triandis, 1980 cited in Glanz et al., 2015).

Glanz et al. (2015) stated that no serious environmental constraints are likely to increase behavioral intention for changing behavior and lead to behavioral performance. The participants in this study who were adults with HTN have many responsibilities in their life, particularly in the area of work. Most of the participants were in the workforce age group and most of them had a job (87.5%). They spent much time at their workplace for putting in their hours of work. It is possible that intentions were affected by situations in the workplace which might intervene and disrupt the relationship between attitude and lifestyle modification behaviors. Difficulties of execution in behavior performance may limit volitional control (Ajzen, 2002). Thus, intention did not influence lifestyle modification behaviors both directly or indirectly.

Nonetheless, the final model showed that intention directly and positively affected trying (β = .18, p < .01). It means that the higher intention creates trying to adopt lifestyle modification behaviors. The possible reason is that more than half of the participants have lived with HTN for a short-duration (M = 5.5 years). A new experience or new information about controlling HTN such as LMB would motivate them to try to do so. Consistently, the level of intention was high (M = 8.3) in this study. Although the participants had high intention, it could change by time (Ajzen, 1985). When time goes by, persons could change their intention to try LMB. It was presented that intention had a low magnitude path to trying.

Furthermore, the finding could be explained based on theory and previous studies. Conceptually, Ajzen (1991) proposed that intentions are assumed to capture the motivational factors that influence a behavior and indicate about the degree of willing to try or degree of effort persons are planning to exert in order to perform the behavior. Stronger intentions lead to increased effort to perform the behavior, which also increases the likelihood for the behavior to be performed.

The finding of this study was consistent with Bagozzi and Warshaw (1990) in which they proposed that intention determines trying to achieve the goal. Moreover, this finding was supported from the two previous studies (Taylor et al., 2005; Baghianimoghadam et al., 2011). Intentions was an influence among American patients with HTN ($\beta = .52$, $p < .01$) in the study by Taylor et al. (2005). A study in Iran found that intention positively influenced on trying in Iranian adults with HTN (Baghianimoghadam et al., 2011).

2.3 Influence of trying on lifestyle modification behaviors

Trying is a process of goal striving to perform a behavior (Bagozzi & Warshaw, 1990) and it plays a key process intervening between intentions and behavior (Taylor et al., 2005). It was defined as an individual assessment of how much effort one will expend or has expended in goal pursuit which tries in the senses of devoting time to planning, expending mental/physical energy, maintaining willpower, and sustaining self-discipline (Taylor et al., 2005). It was surprising that the final model showed that trying did not affect lifestyle modification behaviors

which none of the empirical studies supported the relationship between trying and behavior. So, the third hypothesis was not supported in this study.

The finding presented that trying did not influence on lifestyle modification behaviors. The reason is that lifestyle modification behaviors were multiple behaviors which combined five sub-behaviors (dietary consumption, physical activity, avoiding risks, stress management, and seeking follow up). Some sub-behaviors of LMB are powerful habits such as exercise, dieting, or drinking. Patients were recommended to make these sub-behaviors to maintain or reduce blood pressure levels. These changes would not occur if people did not value the goal underlying the behavioral modification (Peters & Templin, 2010). These multiple behaviors are important, so that the patients were likely to put effort in changing their lifestyle behaviors. However, changing multiple behaviors needs many attempts to be successful. Thus, it might be that when they tried to do these behaviors and experienced failure to perform the behaviors, they tended to quit the behaviors.

2.4 Influence of desire on lifestyle modification behaviors

Hypothesis 4 stated that desire had a positive and direct influence on intention, and positive indirect influences on trying and lifestyle modification behaviors through intention. The final model found that desire positively and directly affected intention ($\beta = .54$, $p < .001$). It is interesting to note that the second highest magnitude path in the final model was from desire to intention. Also, desire positively and indirectly affected trying through intention ($\beta = .10$, $p < .05$). However, desire did not have an indirect influence on lifestyle modification behaviors through intention.

Thus, the possible reasons for partially supporting the fourth hypothesis are explained as follows.

Firstly, this study showed the highest magnitude path from desire to intention, perhaps because about two-thirds of the participants were laborers (62.9%) and had an income of less than 10,000 baht per month (60%). They were responsible for earning money for their family. When they were diagnosed with an HTN, it might affect their work which would decrease their income. To prevent the effect from their disease, they need to control their BP by taking drugs and LMB as well as prevent any complications from HTN. Also, the finding showed that half of the participants had co-morbidities (51.2%). Thus, this is a reason why they had a high level of desire in this study (M= 8.2). When they had high desire, it also might increase their intention to LMB.

The positive correlation between desire and intention to adopt lifestyle modification behaviors in this study is congruent with the Model of Goal-Directed Behavior (MGB) and the two previous studies (Baghianimoghadam et al., 2011; Taylor et al., 2005). According to MGB, Perugini and Bagozzi (2001) proposed that desire provides the motivational impetus for intentions, that is, people are aware of and accept their desire to act, and this will motivate him or her to form an intention. In one word, desire represents the motivational state of mind wherein appraisals and reasons to act are transformed into intention (Bagozzi, Dholakia, & Basuroy, 2003). So, when persons have a high degree of desire, they are likely to increase their intention to adopt lifestyle modification behaviors. The study by Taylor et al. (2005) in the US examined decisions to control hypertension, based on MGB. They found

that the influence of desire on intention was positive across both sexes (male and female) and goal-types (maintainers and reducers). Desire could explain the variance for intention in 88% in men, 67% in women, 95% in maintainers, and 58% in reducers, together with PBC. A study in Iran in a large population of adults with HTN found that increasing desire of self-regulation of blood pressure could increase the intention of self-regulation of hypertension ($\beta = .30$, $p < .01$) (Baghianimoghadam et al., 2011).

Moreover, the present finding showed that desire indirectly influenced on trying via intention. This study was not consistent with the previous study in Iran. Baghianimoghadam et al. (2011) found that desire influenced on intention. Their study was conducted in participants aged from 30 to 86 years old and more than half of their participants were unemployed, whereas only 12.5% of the participants in the present study had no work. Also, the finding by Taylor (2005) presented that desire did not have an indirect influence on trying via intention in women and reducer HTN patients. Nonetheless, this finding is congruent with the prior finding by Taylor (2005) which found that desire had an indirect influence on trying via intention in men and adult maintainers with HTN. Thus, it is assumed that desire affected trying to adopt lifestyle modification behaviors via intention.

Another finding of this study revealed that desire did not have an indirect influence on lifestyle modification behaviors via intention. No empirical studies supported these relationships in adults with hypertension. Based on MGB, a previous study in Italy by Perugini and Bagozzi (2001) found that desire indirectly and strongly affected behavior via intention to regulate body weight and exercise.

However, their study was conducted in university students who did not have a history of hypertension which is a reason for the difference in the finding.

Moreover, MGB demonstrates that desires serve as essential mediators and give the direct force for intentions and transform the motivational content to perform behavior (Perugini & Bagozzi, 2001) but this finding did not support MGB. It may explain that intentions are determined by desires; intentions reflect a commitment to act, whereas persons have a desire to do something but in some circumstances do not feel a commitment to act. Of course when persons are not committed to act, they also do not perform behavior. For this study, lifestyle modification behaviors may be a circumstance, because it was multiple behaviors. In addition, the participants had to live with HTN throughout their lives because HTN is a chronic illness. The maximum years of living with HTN in this study was 26 years. So, changes in intention could occur, because intention could change by time (Ajzen, 1985). Although the participants had a high desire, the LMB might not perform if intention decreased.

2.5 Influence of attitude on lifestyle modification behaviors

The researcher proposed a fifth hypothesis that a) attitude had a positive and direct influence on intention and lifestyle modification behaviors, and b) attitude had a positive and indirect influence on trying and lifestyle modification behaviors through intention. In the final model, attitude did not influence on intention and lifestyle modification behaviors and it also did not affect LMB and trying via intention. Thus, the fifth hypothesis was not supported. However, in this final model

attitude had positive and direct influences on desire and PBC, and it had positive and indirect influences on LMB, intention, trying, and desire via PBC.

Although the participants had high attitudes for LMB, some reasons may impede the participants to perform LMB. Possibly, making money for their family was the main burden of this age. Most participants in this study had a low-income (60%) and were working, (87.50%) and, thus had to spend their time to earn money to take care of their family. So, lack of time might be a cause for performing LMB. Also, spending extra money to cook suitable food to control HTN might be a problem for these participants.

In addition, attitude was formed by knowledge and experience (Fishbein & Ajzen, 1975). Almost 100% of the participants received HTN knowledge from health personnel. Also, the participants had many experiences of controlling HTN because most participants had BP levels less than 140/90 mmHg in their last three visits. Although the participant had a good attitude to modify lifestyle behaviors, they did not perform LMB after follow up because they perceived that they could control their BP. Therefore, it could be seen that good attitudes did not affect intention and LMB in this population.

According to the previous study, Taylor et al. (2005) found that higher attitudes did not create higher intentions in both African American men and women with HTN. Taylor et al.'s results are the same as this finding which showed that attitude did not have direct and indirect influences on intention and lifestyle modification behaviors among adults with HTN. Conversely, attitude was found to be a strong significant variable in several previous studies such as in the USA, Iran, and

Thailand. A study in the USA by Peters and Templin (2010) found that attitude towards blood pressure control was a powerful and indirect influence on hypertension self-care behavior via intention (β = .87, p < .05) among Americans with HTN. The study in Iran in a large population of adults with HTN by Baghianimoghadam et al. (2011) found that attitude directly influenced intention.

Furthermore, the finding of this study was not consistent with the previous study conducted in Thailand. Baiya (2011) found that attitude correlated positively with health behaviors (eating behavior, exercise behavior, medication taking, stress management, and follow up) in adults with HTN (r = .46, p < .05) and could explain 47.3% of variance in health behavior among hypertensive patients, together with family functioning and the health behavior of a family. The reason for the different findings may be that the Baiya's study was conducted only in one province, whereas this study was conducted in several areas in Thailand. It was possible that the varieties of participants from different areas might differ in the formation of beliefs.

Interestingly, the findings revealed that the highest magnitude path in this study was from attitude to PBC (β = .56, p < .001), and it had positive and indirect influences on LMB, intention, trying, and desire via PBC also. These findings were not found in previous studies. The reason might be that person who has positive attitude to perform lifestyle modification behaviors, tends to perceive high power of control themselves to perform behaviors because positive belief would facilitate their ability to perform LMB. Peters and Templin (2010) indicated that a person's beliefs as probability that various factors (e.g. insurance, finance, family, or job

responsibilities) would facilitate/impede their ability to keep blood pressure levels down as well as how often those facilitators/barriers occurred in the person's life. Also, attitude reflects a person's belief regarding the behavior combined with the value the person places on the outcome of performing the behavior.

Moreover, attitude had positive and direct influences on desire. These were the similar results with the previous studies. Baghianimoghadam et al. (2011)'s study revealed that significant influences on desire were found for attitude (β = .19, $p < 0.05$) in patients with HTN in Yard city. Similarly, attitude had positive and direct influences on desire among patients with hypertension (in men and maintainers) which carried out by Taylor et al. (2005)'s study. Attitude is the degree to which the performance of the behavior is positively or negatively valued (Peters & Templin, 2010). Positive attitude is likely to increase desire for performing behavior because desires is a reason for acting that a decision maker takes into account to form a self-commitment to act which is influenced on attitude, subjective norms, anticipated emotions, and perceived behavioral control (Taylor et al. 2005).

2.6 Influence of perceived behavioral control on lifestyle modification behaviors

The researcher proposed a sixth hypothesis that a) perceived behavioral control (PBC) had a positive and direct influence on intention, trying, and lifestyle modification behaviors, b) a positive and indirect influence on trying through intention, and c) a positive and indirect influence on lifestyle modification behaviors through trying and intention. As seen in the final model, PBC had positive and direct

influences on desire, intention, trying, and lifestyle modification behaviors ($\beta = .29$, p < .01, $\beta = .18$, $p < .01$; $\beta = .15$, $p < .05$, and $\beta = .33$, $p < .001$, respectively). Also, PBC had positive and indirect influences on intention and trying ($\beta = .15$, $p < .01$ and $\beta = .06$, $p < .05$); however, it did not has an indirect influence on lifestyle modification behaviors. The sixth hypothesis was partially supported.

It is interesting to note that PBC had a strong positive influence on desire, intention, trying, and lifestyle modification behaviors. Likewise, PBC indirectly influenced intention and trying. According to Ajzen (2002), a control factor depends on both internal (i.e. knowledge, skills, willpower, or background) and external factors (i.e. money, time, or accessibility). For this study, the possible reason for the findings is that nearly half of the participants had levels of education higher than elementary education (49.75%). Likewise, most participants gained HTN knowledge from health care personnel and more than half received knowledge from HTN patients and family members. Increasing PBC was formed when the participants had a strong internal factor such as plenty of knowledge about controlling HTN.

Nonetheless, there was a moderate level of PBC and it had a low to moderated magnitude path to intention, trying, and LMB. This might be due to some external factors. Lack of time and difficulty of cooperation with others may be limitations among the workforce population of the participants in this study. These limitations were quite hard to control because the participants spent most of their time working. Also, if they had to visit an HTN clinic for follow up, they may need to ask for permission from their employer which would not be in their control if their

employer refused the request. Thus, these were reasons why PBC did not affect desire, intention, trying, and LMB at a high level.

These findings were supported by theory and prior studies (Baghianimoghadam et al., 2011; Chen et al., 2011; Peters & Templin, 2010). According to the Theory of Planned Behavior (TPB) expanding to MGB, a high level of PBC should strengthen an individual's intention to perform a behavior, and increase effort and perseverance (Ajzen, 2002). Baghianimoghadam et al. (2011) reported that PBC affected intention (β =.33, p <.05) and PBC together with intention could explain 52% of variance in trying for self-regulation in blood pressure among adults with HTN. PBC was a strong predictor of blood pressure self-care in African Americans adults with HTN (β =.40, p <.05) as demonstrated in the study conducted by Peters and Templin (2010). This is consistency with a study in Taiwan by Chen et al. (2011) which found that perceived control significantly affected self-management (diet pattern and exercise behavior) in patients with hypertension (β = .52). Thus, the associations among PBC, intention, trying, and LMB in this study were congruent with TPB and previous studies in several countries.

Conceptually, Ajzen (2002) proposed that PBC can affect behavior indirectly by its impact on intention. However, this study found that PBC did not have an influence on lifestyle modification behaviors indirectly. No previous studies which were conducted in patients with HTN supported an indirect influence of PBC on lifestyle modification behaviors. This is congruent with Fishbein and Ajzen (2010, cited in Glanz et al., 2015) who stated that relationships among PBC, intention, and behavior have received very little empirical support. Possibly, increasing PBC was

likely to deal with behaviors in which people lack complete volitional control over the behavior easily. Lifestyle modification behaviors which were complex and difficulties of execution might limit volitional control of participants. It may be that participants had perceived behavioral control at a moderate level which indicated that they were not likely to carry out their intention and perform LMB.

2.7 Influence of self-efficacy on lifestyle modification behaviors

Hypothesis 7 proposed that self-efficacy had a positive direct influence on lifestyle modification behaviors. The finding showed that self-efficacy did not affect lifestyle modification behaviors in this context of Thai adults with HTN. Instead, self-efficacy affected desire and trying positively and directly in the final model. Also, self-efficacy had positive and indirect influences on intention and trying. Thus, the seventh hypothesis was partially supported.

This finding differed from previous studies in the USA and Thailand. A study in Thailand, carried out by Pinprapapan et al. (2013), was conducted in 321 adults with HTN in a northern Thai province. The finding presented that perceived self-efficacy influenced adherence to therapeutic regimens (i.e., lifestyle modification behaviors and medical adherence). Also, Warren-Findlow et al. (2012) studied the association between self-efficacy and hypertension self-care activities among African Americans adults with hypertension. They found that good self-efficacy to manage HTN increased the percentage of adults adhering to the JNC7 recommended behaviors. The possible reason in the difference of the findings was that participants had a moderate level of self-efficacy scores. It means that they felt moderately

confident in their ability to prepare lifestyle modification behaviors. Since most participants had a job (87.5%), worrying about job responsibility impeded them to perform LMB. This is congruent with Glanz et al. (2015) who said that personal change would be much easier if there were no barriers on the path to success; for example, a person who has low self-efficacy in his/her ability to overcome the barriers tends to be less likely to perform a behavior.

After the revision of the proposed model, the path from self-efficacy to trying and desire were added and re-tested. The final model found that self-efficacy had positive and direct influences on desire and trying ($\beta = .20$, $p < .01$ and $\beta = .46$, $p < .001$) which was the third highest magnitude path in the final model. The finding was surprising because none of the previous studies reported the relationships among self-efficacy, desire, and trying in adults with HTN. According to Bagozzi and Warshaw (1990), they stated that self-efficacy is conceptualized as the subject's subjective assessment of the probability of success and the probability of failure in the effort of behavioral performing. People with a high level of self-efficacy would increase motivation to perform behavior and tend to be more likely to try or maintain a behavior (Glanz et al., 2015). Furthermore, the participants suffered from HTN on an average of 5.5 years. Although the participants had moderate self-efficacy, they had a lot of experience with HTN which would lead them to try to adopt lifestyle modification behaviors. This is consistent with Bandura (1997) who described self-efficacy as being strongly influenced by previous experience with a particular behavioral task which is related to a person's likelihood to engage in the behavior

again. A person begins to develop skills, beliefs about expected outcomes, and a mental representation of his/her level of self-efficacy for behavior.

2.8 Influence of social support on lifestyle modification behaviors

The eighth hypothesis tested the direct influence of social support on lifestyle modification behaviors. The final model presented that social support had a positive and direct effect on desire, intention, and lifestyle modification behaviors (LMB) ($\beta = .17$, $p < .01$, $\beta = .11$, $p < .05$, and $\beta = .38$, $p < .001$, respectively). Also, social support had positive and indirect influences on intention and trying ($\beta = .09$, $p < .05$, and $\beta = .04$, $p < .05$, respectively). Thus, the eighth hypothesis was supported. These findings build on this prior research by confirming the relationships observed in prior theoretical studies. The finding confirmed the association among social support, desire, intention, and LMB because it corresponded with several previous studies, especially in Thailand. Several previous studies (Baiya, 2011; Peamnoom, 2007; Pinprapapan et al., 2013; Kebwai, 2006; and Sukprungprom, 2008) which were conducted in Thailand found that social support would influence on health behaviors relating to HTN control among patients with HTN. For example, a large population study by Purateeranrath (2011) found that emotional support, instrumental and financial support, informational support, and appraisal support correlated with essential hypertension patients' self-cares at Surin Hospital. Similarly, getting encouragement from members of one's family, relatives, and close friends, and getting encouragement from medical and health personnel affected health promoting

behaviors in 336 patients with HTN in a Thai study carried out by Sukprungprom (2008).

According to the concept of social support, Heaney and Israel (cited in Glanz et al., 2008) mentioned that the thoughts and behaviors of the receivers could be affected by the provision of social support, particularly information support. If desired outcomes are produced from the support, then a sense of personal control over specific situations and life domains will be enhanced. So, when persons receive help or assistance including appraisal, emotional, information, and instrumental support, they are more likely to be successful in changing behaviors. This finding was consistent with the concept of social support and previous studies. Possibly, social support is an important part of the way of life in Thailand. Social support was added in the model because this explanatory variable represented the Thai context. In Asian cultures as in Thailand, Thai families are brought up to have close family ties and to respect adults or the elderly, thus when a family member suffers from an illness he or she will seek help and care from their family first (Purateeranrath, 2011).

Consistently, the majority of the participants lived with their family (99.2%) and most of them were working (87.5%) which means that having relationships with relatives and friends could affect an individual's social relationships directly and enhance received support (House et al., 1988). Social support as factors outside the person can induce or facilitate a person to get support for acting or modifying a behavior following the advice or supporter (Sukprungprom, 2008). Moreover, most participants received information and suggestions about HTN from healthcare personnel (97.1%), because they may be trusted and have faith in

them as well as holding the healthcare providers in high regard. Thus, social support appeared to be an important determinant of success in motivation for changing and maintaining a behavior such as the recommend behaviors for blood pressure control.

2.9 Influence of illness identity on lifestyle modification behaviors

The researcher proposed hypothesis 9 that illness identity had a negative and direct influence on lifestyle modification behaviors. In the final model, illness identity did not have a direct influence on lifestyle modification behaviors. However, illness identity had a negative and direct influence on PBC. Thus, the ninth hypothesis was partially supported. The influence of illness identity on PBC were direct and negative. It was possible that illness identity refers to the label or name given to the condition and the symptoms that appear to go with an illness or it can be called "the disease label and its symptom indicator" (Leventhal et al., 2003). Illness identity referred to experiences with symptom which might be barrier factors for changing LMB. Individuals who experience more symptoms may perceive less ability to control he/her illness, this may lead to lower level of PBC. The finding was congruent with the previous study. Chen et al.'s study (2011) found that illness identity had a negative and direct influence on control (treatment and personal control) for self-management (i.e., dietary patterns, exercise behavior) in adults with hypertension (β = -.27, p < .05).

In relation to illness identity and LMB, negative associations were found. Although the researcher had proposed illness identity would explain LMB, it did not. One possible explanation is that illness identity did not have sufficient unique

variance to explain LMB in the context of other explanation variables because of a low score of illness identity. Furthermore, the possible reason may be due to asymptomatic HTN. More than two-thirds of the participants had BP levels less than 140/90 mmHg so would not present with any symptoms. It could be said that high blood pressure or HTN is largely a silent and invisible killer that rarely causes symptoms (AHA, 2016; WHO, 2013). When a symptom is present, patients usually look for causes of the illness and change their actions to cope with the illness (Leventhal et al., 2003). The majority of hypertensive patients ignore their blood pressure because they think symptoms will alert them to the problem. This is congruent with the previous study by Leelacharas (2009) which found that Thai people with hypertension often were not aware of the fact that they had high blood pressure levels because the hypertension symptoms were not clear for them.

WHO (2013) suggested that perception about high blood pressure is a serious warning sign that urgently needs lifestyle modification. In this case, because HTN is symptomless, patients tend to avoid changing their lifestyle behaviors to control their blood pressure levels. Previous studies in Thailand (Leelacharas, 2005; Leelacharas & Rujiwatthanakorn, 2012) found that many Thais visited the hospital when their symptoms were advanced. They gave reasons that in the early stage of HTN often no symptoms showed so that they could not detect high blood pressure by themselves. Thus, illness identity for HTN in this study did not correlate with lifestyle modification behaviors in Thai adults with hypertension.

Another reason is the differences in the instrument for measuring illness identity. Both studies used the same instrument which was modified from

Weinman et al. (1996) but for this study some items were deleted based on suggestions from the panel of experts. The Leecharas (2005) study measured twelve symptoms of identity of hypertension that patients experience while diagnosis with HTN; whereas, this study assessed only five symptoms which were based on a patient's experience in the past month. The number of symptoms and the context of time might relate to a patient's perception of illness identity. There was no evidence to confirm any specific symptoms of HTN. The variety of symptoms might help patients to express their perception easily and the symptoms might not occur over a short time, so illness identity had a significant role in the Leecharas (2005) study.

Chapter 5

Conclusion and Suggestion

This chapter presents the conclusions of the study findings, implications of the study results into nursing science, the strengths and limitations of this study, and suggestions for nursing and future research.

Conclusions of the Study Findings

The purpose of this study was to examine the proposed relationships among selected explanatory variables and lifestyle modification behaviors for hypertension (LMB). The explanatory variables were: attitude, perceived behavioral control (PBC), desire, intention, social support, self-efficacy, and illness identity. The proposed model was developed based on empirical studies, theory, and a Thai context. The Model of Goal-Directed Behavior (MGB) only needed to be an accurate basis for developing this study of LMB of hypertensive adults in Thailand.

A path analytic design was used in this study. The target population was Thai adults who were diagnosed with hypertension by physicians. This study yielded a probability sample of 240 Thai adults with hypertension and the samples were recruited at the out-patient clinics in five regions of Thailand. A set of questionnaires was used to collect the data. Six questionnaires consisting of the Demographic data questionnaire, the Hypertensive Social Support Scale, the Model of Goal-directed Behavior Questionnaire, the Perceived Self-efficacy about Hypertension Questionnaire, the Illness Identity Scale, and the Lifestyle Modification

Questionnaire. Two of six questionnaires were back translated from English to Thai by six translators who were specialists in adults with hypertension and who use Thai and English languages effectively, and one specialist was a native English speaker.

Prior to data collection, the questionnaires were examined for content validity, language suitability, and scoring criteria by three experts who had experience in adults with hypertension. The experts were asked to rate each item of the instruments on a 4-point scale scoring from 1 (very irrelevant) to 4 (very relevant). The content validity index (CVI) was the proportion of items on an instrument that achieved a rating of 3 or 4 by all the experts (Polit & Beck, 2006). The value of CVI of all the research questionnaires ranged from .80 to 1.00.

The internal consistency reliability was examined using the Cronbach's alpha in four questionnaires included the Hypertensive Social Support Scale, the Perceived Self-efficacy about Hypertension Questionnaire, the Model of Goal-directed Behavior Questionnaire, and the Lifestyle Modification Questionnaire, and using Kuder-Richardson 20 (*KR20*) in the Illness Identity Scale. The results of the internal consistency of all the questionnaires ranged between .80 and .95, except for the intention and attitude questionnaires. The researcher improved these two questionnaires until they were accepted at a value of higher than .70 of Cronbach's alpha coefficient.

Descriptive statistics and assumptions underlying path analysis including normality, linearity, homoscedasticity, and multicollinearity were determined. Statistical significance was set at $p < .05$ for this study. A computer program was used for testing the proposed model. Path analysis was used to examine the relationship

between explanatory variables and lifestyle modification behaviors. From the findings, given that some of the goodness of fit values did not support the proposed model, the chi-square (χ^2) was 76.06 and degree of freedom (*df*) was 9, with a significant chi-squared test result (*p* = .00). The goodness-of-fit indices were RMSEA = .18, GFI = .94, AGFI = .71, CFI = .90, NNFI = .61, and SRMR = .08.

In order to improve the goodness-of-fit of the proposed model, the originally proposed model was revised based on findings from prior model testing and theoretical reasoning. The largest modification index (60.88) was from self-efficacy to trying, so this path was added to improve the model. Three paths were added from 'attitude' to 'desire', 'PBC' to 'desire', and 'attitude' to 'PBC', because these parameters were meaningful and theoretically sound. Moreover, three paths including from 'illness identity', 'self-efficacy' 'attitude' to 'LMB' was deleted from the model because the associated βs were not significantly different from zero. So, there were 16 paths in the final model. The insignificance of the chi-square test result (*p* = .51) and the goodness-of-fit indices (RMSEA = .00, GFI = .99, AGFI = .96, CFI = 1.00, NNFI = 1.00, and SRMR = .03) indicated that the final model fitted well with the empirical data.

The overall research hypotheses were partially supported. The standard path coefficients and proportions of variance of the endogenous variables explained (R^2) are presented in a path diagram. About 14 paths of the total number of paths were significant. PBC and social support had positive and direct influences on LMB (β = .33, *p* < .001; β = .38, *p* < .001, respectively). Desire, social support, and PBC had positive and direct influences on intention (β = .54, *p* < .001; β = .11, *p* < .05, β =

.18, *p* < .01, respectively). Self-efficacy, intention, and PBC had positive and direct influences on trying (β = .46, *p* < .001; β = .18, *p* < .01; β = .18, *p* < .05, respectively). Attitude, social support, self-efficacy, and PBC influenced on desire positively and directly (β = .26, *p* < .001; β = .17, *p* < .01; β = .20, *p* < .01; β = .29, *p* < .01, respectively). PBC was directly affected from attitude and illness identity (β = .56, *p* < .001; β = -.18, *p* < .01, respectively). Moreover, the final model accounted for 35%, 39%, 47%, 30%, and 38% of the total variance in desire, PBC, intention, trying, and lifestyle modification behaviors, respectively.

Contributions of the Study Results into Nursing Science

Because of the complexity of human behavior, understanding the causes of behavior and how influencing factors shape behavior are necessary for the modification of behavior. Lifestyle modification behaviors are an important treatment to control HTN. Nurses have an important role to promote LMB in people with HTN. A nurse needs greater understanding about the behavioral patterns and factors which push people to behave in a certain way. A causal study is used to answer questions regarding the relationships between variables and to explain about understanding the phenomena under study (Munro, 2001). The influences of independent variables in more complex ways which are the same as human behavior were challenged.

The interrelationship among the explanatory variables had not been investigated in previous studies and knowledge about adults from Asian countries with HTN in this context was even limited. Consequently, the model of lifestyle modification behaviors in Thai adults with HTN was necessary to gain an

understanding about the behaviors. The hypothesized model was developed based on MGB and empirical studies which consisted of eight explanatory variables and one dependent variable. In several past studies of Thai adults with HTN, the prior researchers did not apply Model of Goal-Directed Behavior (MGB) but this study has done so. In regards to the HTN perspective, the MGB could explain how individuals carry out the intention of improving their health and this view was served as a basis for understanding the health motivation of HTN adults as well. Previous studies in other countries which were guided by MGB only assumed a relationship between explanatory variables and trying among adults with HTN. The prior researchers evaluated theoretical explanations from MGB with "trying" as the outcome, whereas "behavior" was examined as a preferred outcome measure in this study. Thus, this study was the first to examine MGB and empirical research to explain lifestyle modification behaviors (LMB) in Thai adults with hypertension, although the finding did not supported the influence of trying on lifestyle modification behaviors (LMB).

Using path analysis to analyze all the variables concurrently, after model revision the findings presented an overall path model linking the selected explanatory variables, intention, trying, and lifestyle modification behaviors with a directional pathway. PBC and social support were identified as having a direct and positive influence on LMB. Attitude and illness identity influenced on LMB also, and they were mediated by PBC. In addition, self-efficacy, PBC, and intention affected trying positively and directly. Social support, desire, and PBC had positive and direct influences on intention. Attitude, social support, self-efficacy, and PBC influenced on desire positively and directly. PBC was directly affected from attitude and illness

identity. The positive relationships among selected explanatory variables and the outcome in this study support propositions from MGB. Additionally, the final model accounted for 38% of the variance in lifestyle modification behaviors, respectively. The findings not only add to the growing body of evidence in regards to the selected explanatory variables that significantly influenced trying, but also emphasize the significance of lifestyle modification behaviors among Thai adults with hypertension. This model also helps to expand knowledge of psychosocial factors, such as social support and perceived behavioral control (PBC), which affected lifestyle modification behaviors. Therefore, these results can help nurses to enhance their understanding of the interrelationships between these variables among Thai adults with HTN.

The Strengths and Limitations of This Study

  Strengths of this study

  1. Theoretical or conceptual framework: This study evaluated the predictive utility of the model among Thai adults with hypertension guided by the Model of Goal Directed Behavior (MGB). The MGB could explain and reflect a process of decision making to perform a behavior. The previous studies conducted in Thailand did not examine the studies based on the MGB. The findings provide an extension of the model for explaining lifestyle modification behavior in another culture. This was the first study which used MGB to explain lifestyle modification behaviors in Thai adults with HTN.

  2. Thai context: Besides MGB, four explanatory variables were added in the proposed model based on empirical studies. Two explanatory variables such as self-

efficacy and social support were selected from prior studies that had been conducted in Thailand. These two explanatory variables were found to have had a powerful influence on health behaviors in Thai adults with HTN. From the findings, the final model exhibited that self-efficacy had positive and direct influences on desire and trying, and also social support positively and directly affected desire, intention, and lifestyle modification behaviors in this study. Obviously, the final model of lifestyle modification behaviors consorted with the Thai context since these two variables were supported in this study.

3. *Research method:* This was a full causal model which examined lifestyle modification behaviors among Thai adults with HTN in the past decade. This study used a causal study to explain a set of relationships among variables which was complex like human behavior. Furthermore, this study had a large sample size and all the samples were recruited from all parts of Thailand by using a four-stage random sampling procedure. All research questionnaires were accepted for both validity and reliability. The statistical analysis, both descriptive and path analyses strictly tested assumptions and correctly analyzed the data. Therefore, the findings in this study could be generalized in Thai adults with HTN.

4. *Research findings:* The findings found the final model in this study fitted well with the empirical data. About 14 of 16 paths were significant. About 5 significant paths were moderated to high magnitude paths ($\beta = .33 - .56$). It was interesting to note that new significant paths in the final model were found in this study such as from self-efficacy to trying which had a moderate magnitude ($\beta = .46$), attitude to PBC which had a quite high magnitude ($\beta = .56$). These relationships did

not present in previous studies both in Thailand and other countries Thus, these findings in the study were interesting among adults with HTN.

Limitations of this study

1. Although the percentage of the variance in desire, intention, and trying in this finding was similar to the previous model (Taylor et al., 2005), the researcher could not compare that this finding is the same as the previous model because all the variables from MGB were not examined in this study, as in the previous model. The MGB was only used to guide this research. Some variables from the MGB were selected to propose the hypothesized model of lifestyle modification behaviors in Thai adults with HTN. Because all variables of MGB has never been tested in Asian countries, so further testing of the MGB may gain more knowledge about adults with HTN in the future.

2. A second limitation was that this study was a cross-sectional design which was measured at a single point in time, and it was possible that an individual's assessment of a participant's perceptions could change by time due to individual conditions. Data collecting finished within one month. The participants might forget and had some confusion about the time of some items, such as the LMB questionnaire asks about activities performed one month ago and other questionnaires asks about perceptions in next four weeks. Thus, in order to detect developments or changes in lifestyle modification behaviors of the population at individual levels, a longitudinal study would provide much better data.

3. According to the JNC-7 and -8 guidelines, the committees mentioned the term of "lifestyle modifications" in HTN patients. In order to follow both guidelines, this study used the term of "lifestyle modification behaviors (LMB)" as a dependent variable. However, this term of LMB was difference term from several previous HTN studies. Also, some studies examined all behaviors of LMB following both guidelines and some studies tested some part of LMB. Therefore, further study might examine each behavior which was a part of LMB or use the frequently term as dependent variable.

Suggestions for Nursing Practice and Future Research

Suggestions for nursing practice, administration, and education

1. Nursing practice

The finding revealed that social support and perceived behavioral control (PBC) had positive and direct influences on lifestyle modification behaviors and accounted for 38% of the variance in lifestyle modification behaviors among Thai adults with hypertension. It means that greater lifestyle modification behavior would be increased from greater level of social support and PBC. This finding provides recommendations for clinical nursing practice.

1) A nurse may incorporate social support and PBC to promote lifestyle modification behavior among adults with hypertension. For assessing, a nurse may screen the level of social support and PBC before planning to help adult with hypertension. For adults with a lower level of social support and PBC, an individualized plan of care could be delivered to develop lifestyle modification

behaviors for them by promotion from the nurse. In another who can keep high PBC and social support, nurse should empower and positive reinforce to maintain the behavior.

2) The findings found that more than half of the participants received support from their family members (51.67%). Therefore, a nurse may recommend and facilitate family members to support adults with hypertension to change lifestyle behaviors.

3) A nurse may provide a sharing forum among adults with hypertension to learn about how to gain success in lifestyle modification behaviors, due to over half of the participants (52.92%) received hypertension knowledge from adults with hypertension.

4) Because the participants reported that the best source of hypertension knowledge was provided by nurse or other health personnel (97.08%). A nurse should prepare and provide essential knowledge about lifestyle modification behaviors for adult with hypertension continuously. A small group discussion may be provided by nurse for health education and sharing experiences between hypertension patients and nurse to promote lifestyle modification behaviors.

5) The results in the final model could help to deepen understanding of the influences of explanatory variables on lifestyle modification behaviors and the mediating role of four variables (desire, PBC, intention, and trying). A nurse may design and develop an intervention/program to improve the lifestyle modification behaviors of adults with hypertension by combining all significant variables such as attitude, illness identity, PBC, and social support in the program.

2. Nursing administration

To get achievement for lifestyle modification behaviors, collaboration between health personnel would help patients to have better changes in their lifestyle behaviors.

1) A nurse administrator may encourage healthcare team to collaborate for design and develop an intervention/program to promote lifestyle modification behaviors in adults with hypertension.

2) A nurse administrator may recommend and facilitate a nurse to provide social support and increase perceived behavioral control for their patients because these two variables were direct and powerful influences on lifestyle modification behaviors. The nurse administrator may coordinate with family members to participate in supporting the adults with hypertension. Also the other significant variables should be emphasized to increase desire, PBC, intention, trying, and lifestyle modification behaviors for adult with hypertension by the nurse administrator.

3) A nurse administrator should make an effort to implement policies for controlling hypertension by encouraging adult with hypertension to take proper care of their lifestyle behaviors.

3. Nursing education

A nurse educator may provide the findings to enhance a student's knowledge about significant variables such as social support and perceived behavioral control which affected lifestyle modification behaviors for Thai adults with hypertension. A nurse educator may encourage and empower nursing students to do

activities or campaigns for lifestyle modification behaviors among adults with hypertension by applying the study results which the students have sufficient knowledge for helping adults with hypertension to change their lifestyle.

Suggestions for future research

1. Future research may lead to the development of programs that help adults with hypertension successfully change their lifestyle behaviors to control blood pressure levels. Additional exploration may be directed toward examining strategies that may increase lifestyle modification behaviors by promoting attitude, illness identity, social support, and perceived behavioral control.

2. In order to confirm the whole Model of Goal-Directed Behaviors (MGB) in Thai adults with hypertension, future research may need to test all variables in the MGB.

3. A longitudinal study may be designed to examine the causal model of lifestyle modification behaviors in Thai adults with hypertension. To have more accuracy in the data, the process of data collection may start from collecting all the variables excepting lifestyle modification behaviors, and after one month lifestyle modification behaviors will be collected.

Therefore, these suggestions will yield more knowledge about lifestyle modification behaviors in the future.

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Appendix A

List of Expert Panels

About three expert panels were invited to evaluate of content validity index and give suggestions for developing and modifying the research instruments. The experts were as follow;

1. Asst. Prof. Dr. Tippamas Chinnawong

Division of Adult and Elderly Nursing, Faculty of Nursing, Prince of Songkla University

2. Dr. Suangsuda Charoenwong

Division of Adult and Elderly Nursing, Faculty of Nursing, Princess of Naradhiwas University

3. Uma Juntawises

Advance Practice Nurse, Department of Nursing, Faculty of Medicine, Prince of Songkla University

Appendix B

List of Experts for Back-Translation of Instruments

About seven expert panels were invited to back translate the research instruments. The experts were as follow;

1. Assoc. Prof. Dr. Karnsunaphat Balthip

Division of Community Nurse Practitioner, Faculty of Nursing, Prince of Songkla University

2. Asst. Prof. Dr. Patcharee Komjakraphan

Division of Community Nurse Practitioner, Faculty of Nursing, Prince of Songkla University

3. Dr. Yupawadee Kantabanlang

Division of Adult and Elderly Nursing, Boromarajonani College of Nursing, Nakhon Si Thammarat

4. Dr. Charuwan Kritpracha

Division of Adult and Elderly Nursing, Faculty of Nursing, Prince of Songkla University

5. Dr. Jintana Damkliang

Division of Adult and Elderly Nursing, Faculty of Nursing, Prince of Songkla University

6. Dr. Chittinan Pongsuwan

Division of Adult and Elderly Nursing, Boromarajonani College of Nursing, Yala

7. Mrs. Jude Hall

Appendix C

Informed Consent Form

Title: A causal model of lifestyle modification behaviors in Thai adults with

hypertension

Researcher: Ms. Patcharawadee Tongnuang

PhD. student, Faculty of Nursing, Prince of Songkla University

Mr./ Mrs./ Ms. …………………………………. is willing to participate in this study. The research study entitles "A causal model of lifestyle modification behaviors in Thai adults with hypertension" which is conducted by Patcharawadee Tongnuang, a Doctoral student in Faculty of Nursing, Prince of Songkla University under supervision of Assoc. Prof. Dr. Piyanuch Jittanoon and Asst. Prof. Dr. Umaporn Boonyasopan. A result of this study would be benefit to promote Thai adults with hypertension to take care properly by themselves in order to obtain the best way to control blood pressure level. This study has been approved by the Institutional Review Board of Prince of Songkla University, and permitted by ethical committee of hospital.

If I decide to participate in this study, I will be asked to fill out a set of questionnaire including 1) the Demographic Data Questionnaire 2) the Hypertensive Social Support Scale 3) the Model of Goal-directed Behavior Questionnaire 4) the Perceived Self-efficacy about Hypertension Questionnaire 5) the Illness Identity Scale and 6) the Lifestyle Modification Questionnaire. All items consist of 67 items and I will take about 60 - 90 minutes for answer all of the questionnaires.

My name will not be attached to the data. Minimal risks such as fatigue and emotional risk such as depressed or aggressive might occur in some subjects while they are completing the questionnaire. The researcher will express concern and prevent, or deal with these problems by inform nurse who has responsibility at the clinic, separate participant from others for taking a rest, suggest me to relax and calm down until I ready to answer the questionnaire completely. Any information that may be obtained concerning this study that can be identified with the researcher will remain confidential and will be disclosed only with my permission. If I have any questions or cannot participate in this study, I can directly contact the researcher. Eventually, I receive information about purpose, risks, and benefits of this research study from the researcher and clearly understand about the study. Thus I present my willingness to participate in this study by signing this document.

Participant's sign .... Date.................................

Researcher's sign .... Date................................

หนังสือแสดงเจตนายินยอมเข้าร่วมโครงการวิจัย

สวัสดีค่ะ ดิฉัน นางสาวพัชราวดี ทองเนื่อง กำลังศึกษาระดับปริญญาเอก คณะพยาบาล

ศาสตร์ มหาวิทยาลัยสงขลานครินทร์ ดำเนินการศึกษาวิจัยเรื่อง แบบจำลองเชิงสาเหตุพฤติกรรม

การปรับเปลี่ยนวิถีการดำเนินชีวิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูง มีวัตถุประสงค์เพื่อศึกษา

ปัจจัยที่เกี่ยวข้องกับการปรับเปลี่ยนวิถีการดำเนินชีวิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูง ทั้งนี้

เพื่อใช้ผลการศึกษาเป็นข้อมูลในการปรับเปลี่ยนวิถีการดำเนินชีวิตในผู้ใหญ่ที่มีภาวะความดัน

โลหิตสูงที่ถูกต้องเหมาะสม

จึงใคร่ขอความร่วมมือจากท่านในการตอบแบบสอบถามตามความเป็นจริง แบบสอบถาม

มีทั้งหมด 10 ส่วน ได้แก่ ส่วนที่ 1 แบบสอบถามข้อมูลส่วนบุคคล ส่วนที่ 2 แบบสอบถาม

พฤติกรรมการปรับเปลี่ยนวิถีการดำเนินชีวิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูง ส่วนที่ 3

แบบสอบถามตามแนวคิดการกระทำที่มุ่งสู่เป้าหมายต่อพฤติกรรมการปรับเปลี่ยนวิถีการดำเนิน

ชีวิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูง ส่วนที่ 4 แบบสอบถามการรับรู้ความเจ็บป่วยจากภาวะ

ความดันโลหิตสูง ส่วนที่ 5 แบบสอบถามการการสนับสนุนทางสังคมของผู้ใหญ่ที่มีภาวะความดัน

โลหิตสูง และส่วนที่ 6 แบบสอบถามการรับรู้สมรรถนะแห่งตนของผู้ใหญ่ที่มีภาวะความดันโลหิต

สูง ข้อคำถามมีทั้งหมด 89 ข้อ ซึ่งจะใช้เวลาในการตอบแบบสอบถามประมาณ 60 – 90 นาที

ในการเข้าร่วมวิจัยครั้งนี้เป็นไปตามความสมัครใจและความยินยอมของท่าน ท่านสามารถ

ถอนตัวจากการทำวิจัยได้ตลอดเวลา ซึ่งการเข้าร่วมหรือไม่เข้าร่วมการทำวิจัยในครั้งนี้ไม่ส่งผล

กระทบใด ๆ ต่อการรักษาของท่าน ข้อมูลที่ได้จากการทำวิจัยครั้งนี้จะนำเสนอในภาพรวมของการ

วิจัยเท่านั้น ที่สำคัญที่สุดของการวิจัยครั้งนี้จะสำเร็จได้ตามวัตถุประสงค์ก็ด้วยความอนุเคราะห์และ

ความร่วมมือจากท่านที่กรุณาสละเวลาตอบแบบสอบถามในครั้งนี้ จึงขอขอบพระคุณเป็นอย่างสูง

ลงชื่อผู้เข้าร่วมวิจัย .... วันที่.................................

ลงชื่อผู้วิจัย .... วันที่.................................

Appendix D

Examples of Research Instruments

A set of questionnaires for a Causal Model of Lifestyle Modification Behaviors in Thai Adults with Hypertension included 6 parts such as;

1) Personal Information

2) The Lifestyle Modification Behaviors in Adults with HTN Questionnaire

3) The Model of Goal-directed Behavior Questionnaire consisted of 5 parts;

    3.1) Attitude

    3.2) Perceived behavioral control

    3.3) Desire

    3.4) Intention

    3.5) Trying

4) The Hypertensive Social Support Scale

5) The Perceived Self-efficacy about Hypertension Questionnaire

6) The Illness Identity Scale
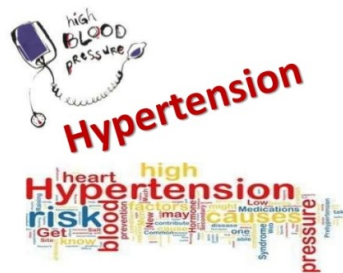
Part 1: Personal Information

1. Age .... years

2. Sex   1) ☐ Male   2) ☐ Female

3. Body weight .... kg.   Height .... cm.

4. Occupation

    1) ☐ Government officer   2) ☐ Office worker

    3) ☐ Service worker/ employee   4) ☐ Agriculturist

    5) ☐ Others (Please identify...)

5. Marital status

    1) ☐ Single   2) ☐ Married

    3) ☐ Divorce   4) ☐ Separated

    5) ☐ Others (Please identify…………………………...............)

6. Religious status

    1) ☐ Buddhist   2) ☐ Muslim

    3) ☐ Christian   4) ☐ Others (Please identify…………)

16. How do you receive information about hypertension? (You can answer more

than one choice)

    1) ☐ Family member

    2) ☐ Closed-friend

    3) ☐ Neighbor

    4) ☐ Community members

    5) ☐ Sharing with hypertensive patients

    11) ☐ Others (Please identify…………………………............)

Part 2: The lifestyle modification behaviors for adult with HTN questionnaire

Items	Never (1)	Sometimes (2)	Often (3)	Always (4)
1. When I eat, I don't add salt, fish sauce, or soy sauce into my food. Or when I cook, I add salt to food less than 1 teaspoon per day.				
2. I avoid eating processed food (such as ham, bacon, bologna, sausage), pickles, meats, or other vegetables in brine (such as salted meat, salted fruits, salted egg, fermented fish), or packaged bakery goods.				
3. I avoid eating canned food and instant food such as instant noodle, canned fish, or canned soup.				
4. ……………………				
5. ……………………				
6. ……………………				

Part 3: The Model of Goal-directed Behavior Questionnaire

    3.1 Attitude for Lifestyle Modification Behaviors

" Considering all the effort and things I would have to do to reduce (maintain) my blood pressure during the next 4 weeks such as exercising, dieting, monitoring my blood pressure, not smoking. My overall attitude toward doing these things makes me feel…. "

1.	Very unpleasant	Unpleasant	Neutral	pleasant	Very pleasant
	1	2	3	4	5

2.   ……………

    3.2 Perceived Behavioral Control for Lifestyle Modification Behaviors

1.   How much control do you feel have over trying to reduce (maintain) your blood pressure during the next 4 weeks?

No control	Little	Some	Substantial	Total control
1	2	3	4	5

2.   ………………………………………

3.3 Desire for Lifestyle Modification Behaviors

1. I want to reduce (maintain) my blood pressure during the next 4 weeks.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

2. ………………………..

3.4 Intention for Lifestyle Modification Behaviors

1. I intend to reduce (maintain) my blood pressure during the next 4 weeks.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

2. ……………………………………

3.6 Trying for Lifestyle Modification Behaviors

The following in this part are lists of your perceptions about "How hard did you try (to reduce/ maintain your blood pressure) during the past four weeks in each of the following senses? "

Items	Not at all (1)	Very little (2)	Moderate (3)	Very hard (4)	Extremely hard (5)
1. Devoting time for planning with respect to however you go about trying to reduce your blood pressure.					
2..……………………………					

Part 4: The Hypertensive Social Support Scale

Items	Level of agreement			
	Strongly Agree	Agree	Less Agree	Strongly Disagree
1. You perceive that family member or friend is caring for your illness and hypertension treatment.				
2. If you have a problem or anxiety about hypertension and treatment, you have person who try to understand and listen to you such as family member or friend.				
3. ……………………………………				

Part 5: The Hypertensive Perceived Self-Efficacy Questionnaire

Questions	Not at all confident (1)	Slightly confident (2)	Quite confident (3)	Very confident (4)	Totally confident (5)
1. How confident are you that you can keep the physical discomfort or symptoms such as dizziness, headache, or blurred-eyed from interfering with the things you want to do?					
2 ………………………….					
3 ……...…………………...					

Part 6: Illness Identity Scale for adults with hypertension

" One month ago, do you think your high blood pressure causes you to experience the following symptoms?"

Symptoms	Yes (1)	No (0)
1. Dizziness		
2. Blurred - eyed		
3. ………………………….		

Appendix E

Testing Assumptions Results

Evaluation of assumptions prior to using path analysis was examined. These were: 1) outliers; 2) normal distribution; 3) independence of error; 4) linearity testing; 5) homoscedasticity; and 6) multi-collinearity.

1. Outliers
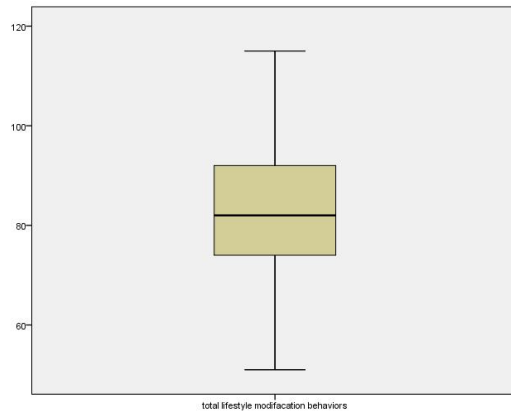
Lifestyle modification behaviors   Self-efficacy
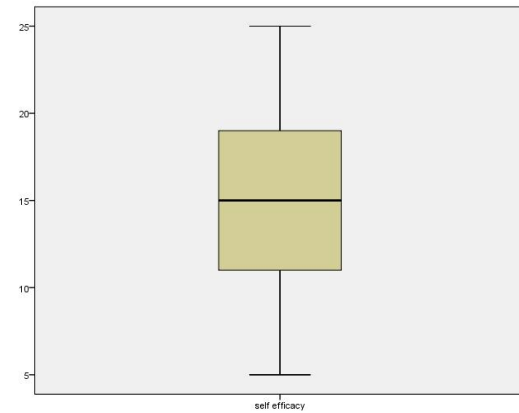
Perceived behavioral control   Social support
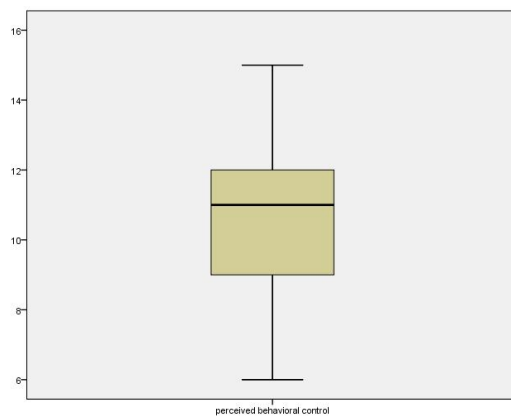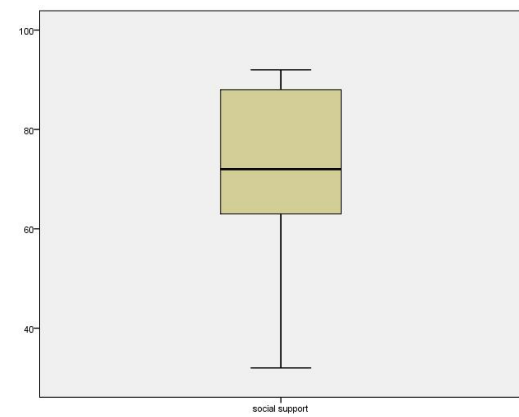
Illness identity   Intention
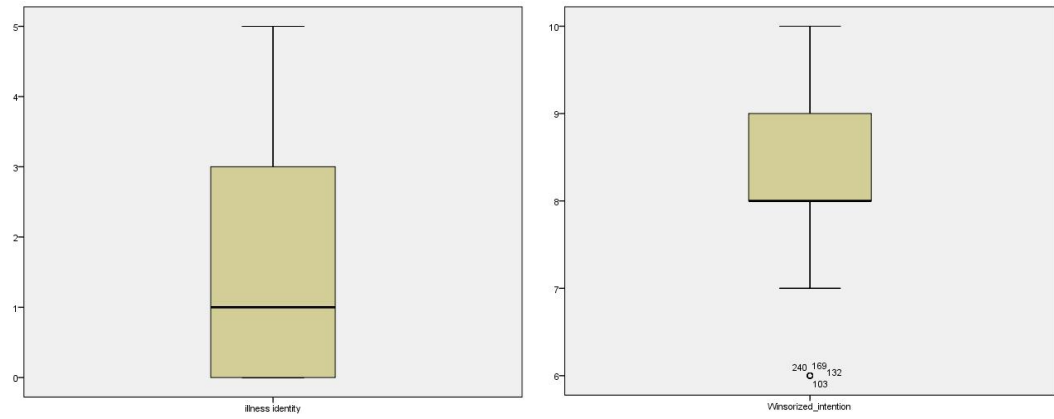
Attitude

Desire
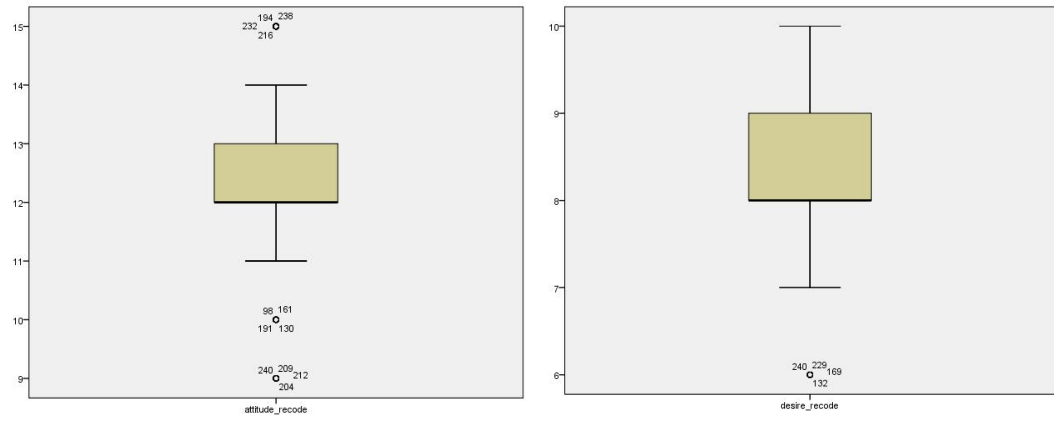
Trying
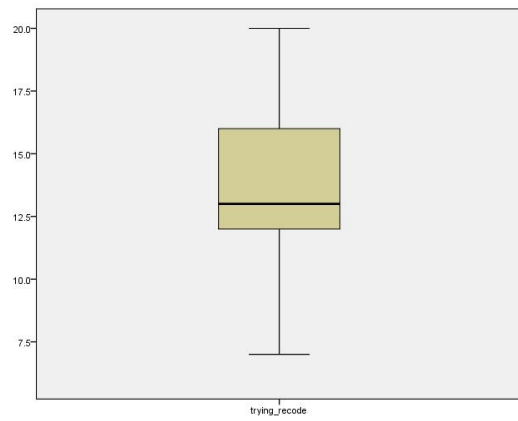
Figure E1. *Box-Plots among all variables*

2. Normal distribution

Table E1

Normal Distributions among All Explanatory Variables

Variables	Mean±SD	Mean±SEM	Skewness	SE$_{Skewness}$	Z$_{Skewness}$	Kurtosis	SE$_{Kurtosis}$	Z$_{Kurtosis}$
LMB	82.58±12.89	82.58±0.83	0.15	0.16	0.94	-0.63	0.31	-2.03
Attitude	12.17±1.39	12.17±0.09	0.17	0.16	1.06	0.59	0.31	1.90
PBC	10.80±1.79	10.80±0.12	0.17	0.16	1.06	-0.15	0.31	-0.48
Trying	13.26±2.92	13.26±0.19	-0.08	0.16	-0.50	0.06	0.31	0.19
Desire	8.18±0.98	8.18±0.06	0.20	0.16	1.25	0.03	0.31	0.10
Intention	8.35±0.86	8.35±.06	0.25	0.16	1.56	0.75	0.31	2.42
SS	73.74±13.76	73.74±0.89	-0.21	0.16	-1.31	-0.75	0.31	-2.42
SE	14.38±5.39	14.38±0.35	-0.27	0.16	-1.69	-0.67	0.31	-2.16
IND	1.65±1.58	1.65±0.10	-0.29	0.16	-1.81	-1.50	0.31	-4.84

Note. LMB=Lifestyle modification behaviors; PBC=Perceived behavioral control; SS=Social support; SE=Self-efficacy; IND=Illness identity; SD=Standard deviation; SEM=Standard error of mean

Figure E2

Histogram among all studied variables
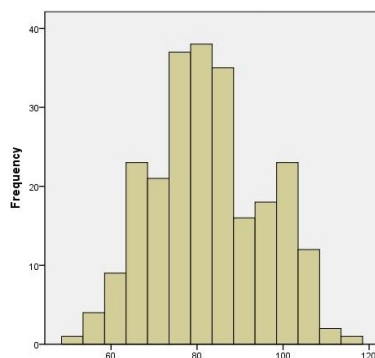
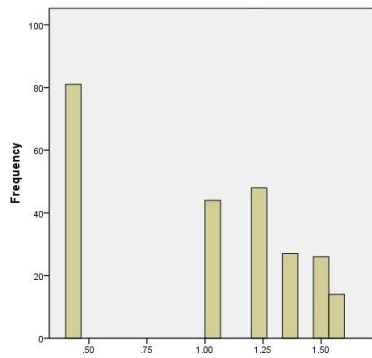Lifestyle modification behaviors   Attitude
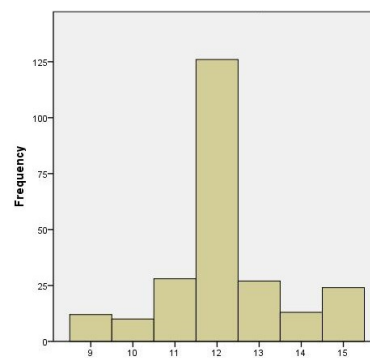
Desire
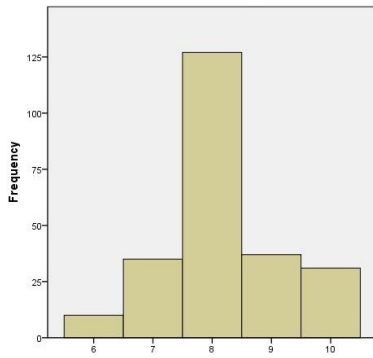
PBC
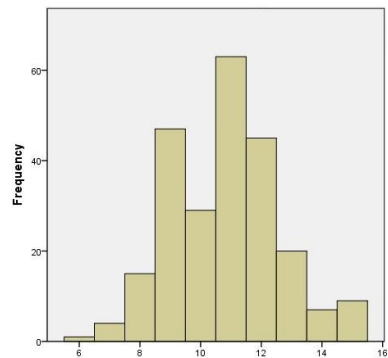
Social support
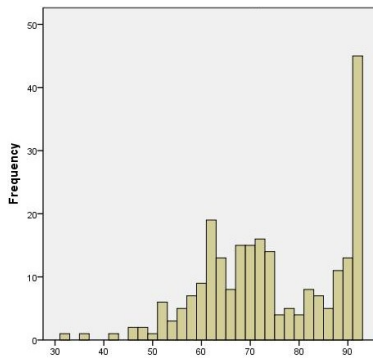
Self-efficacy
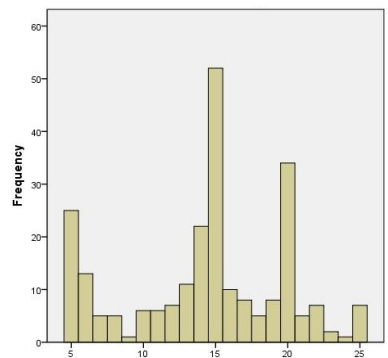
Intention
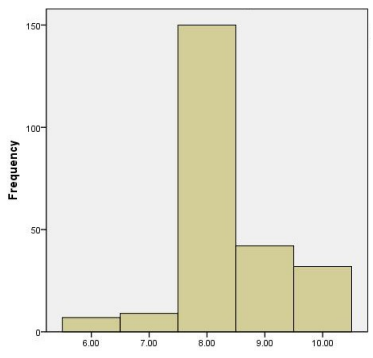
Trying
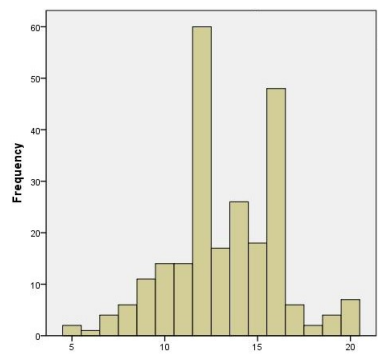
Illness identity

3. Independence of error

Table E2

Durbin-Watson's d Testing

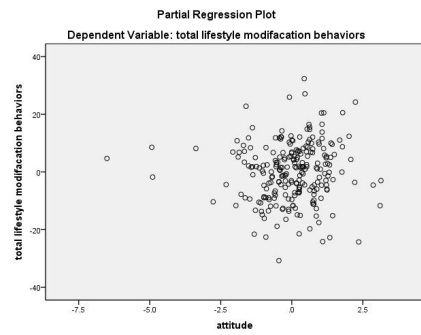| Model	*R*	*R²*	*Adjusted R²*	*F*	*p*	*Durbin-Watson*
1	0.63	0.40	0.37	18.85	0.00	1.47

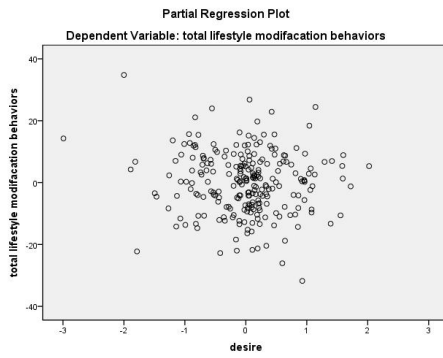*Note.* Dependent variables: Lifestyle modification behaviors

4. Linearity testing

Figure E3

Scatter plots between independent variables and dependent variable

Attitude   PBC
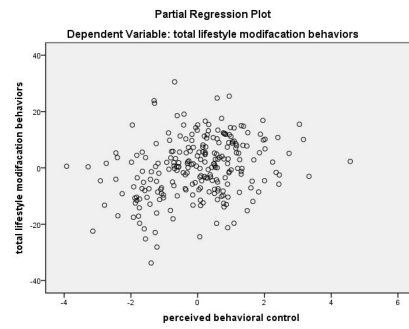
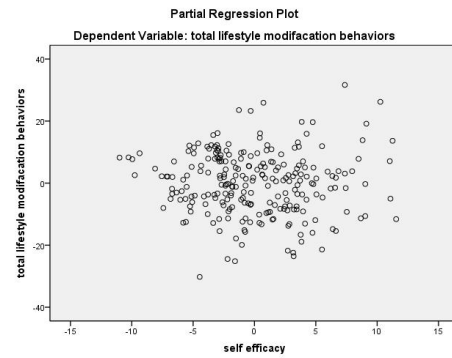Desire   Trying
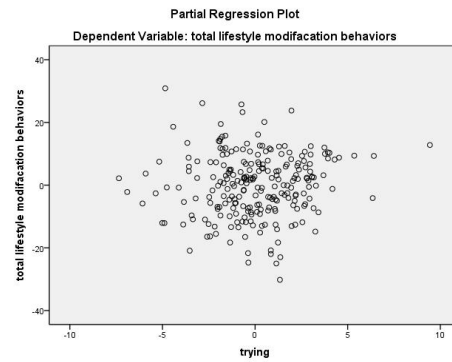
Social support   Self-efficacy
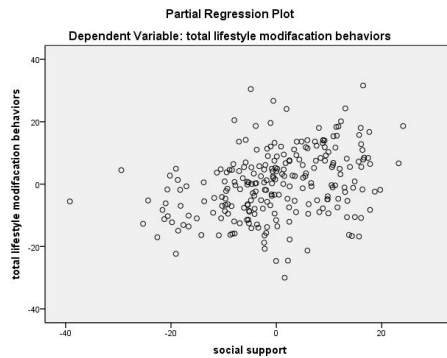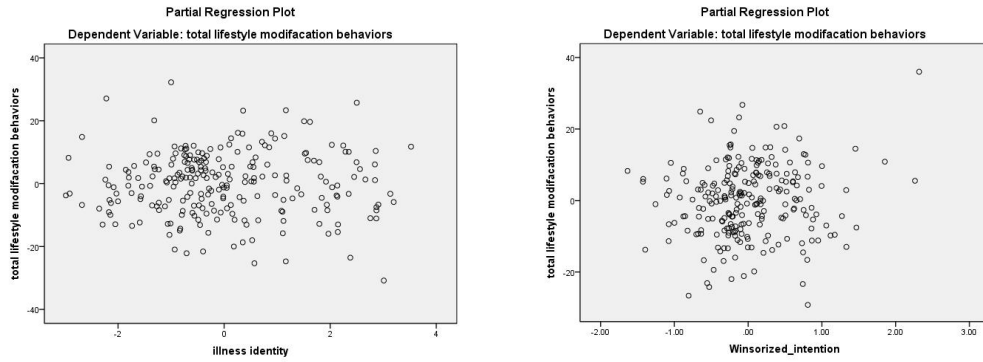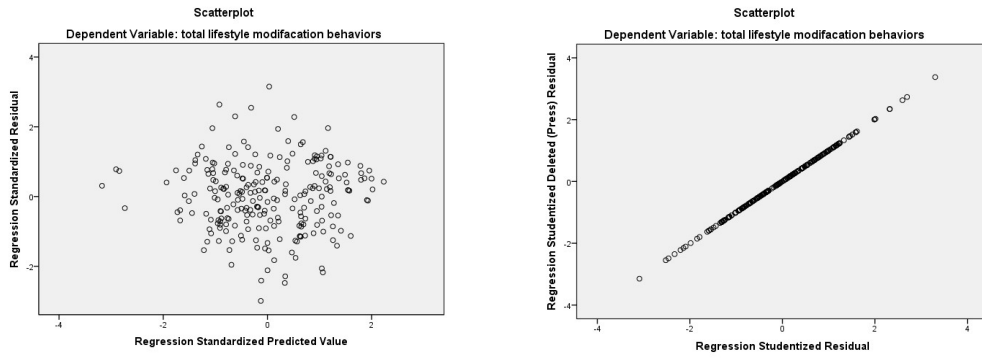

Illness identity   Intention

Figure E4

Scatter plots between standardized residual value and standardized predicted value;

studentized residual value and standardized predicted value

5. Homoscedasticity

Table E3

Levene's Test Between Independent Variables and Dependent Variables

	df1	*df2*	*p*
43.76	238	1	0.12

Note. Dependent Variable: Lifestyle modification behaviors; $p < 0.05$

6. Multicollinearity

Table E4

Collinearity Statistics for Explanatory Variables

Explanatory variables	*Tolerance*	*VIF*
1. Attitude	0.55	1.83
2. Perceived behavioral control	0.52	1.91
3. Desire	0.49	2.06
4. Intention	0.51	1.98
5. Trying	0.68	1.46
6. Social support	0.61	1.64
7. Self-efficacy	0.67	1.49
8. Illness identity	0.80	1.25

Note: Dependent variable = Lifestyle modification behaviors

Appendix F

Permission of Using Research Instruments

โรงเรียนพยาบาลรามาธิบดี

มหาวิทยาลัยมหิดล

โทร ๐๖๙๓

ที่ สผ ๐๖๔/๒๕๕๙

วันที่ ๑๔ กุมภาพันธ์ ๒๕๕๙

เรื่อง ขออนุญาตใช้เครื่องมือวิจัย

เรียน คณบดี คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

ตามที่ได้มีจดหมายเลขที่ ศธ ๐๕๒๑.๑.๐๕/๐๕๙๕ ซึ่งได้ขออนุญาตการใช้เครื่องมือให้กับนักศึกษา นางสาว พัชราวดี ทองเนื่อง รหัสนักศึกษา ๕๕๑๐๔๓๐๐๐๖ หลักสูตรปรัชญาดุษฎีบัณฑิต สาขาการพยาบาล (หลักสูตรนานาชาติ) นั้น ดิฉันมีความยินดีที่จะให้นักศึกษาใช้เครื่องมือวิจัยในส่วนที่แปลเป็นภาษาไทย พร้อม ขอแนะนำให้นักศึกษาขออนุญาตการใช้เครื่องวิจัยในส่วนที่เป็นภาษาอังกฤษจากเจ้าของลิขสิทธิ์ซึ่งเป็นชาว ต่างประเทศโดยตรง หากมีข้อสงสัยหรือต้องการคำแนะนำเพิ่มเติม โปรดติดต่อโดยตรง ที่ โทร ๐๘๕-๓๔๓๔๕๘๙ หรือ E-mail: sirirat.lee@mahidol.edu หรือ sirirat.lee@mahidol.ac.th

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(ผู้ช่วยศาสตราจารย์ ดร.สิริรัตน์ ลีลาจรัส)

อาจารย์ประจำสาขาวิชาการพยาบาลผู้ใหญ่และผู้สูงอายุ

มุ่งเรียนรู้ คู่คุณธรรม ใฝ่คุณภาพ ร่วมสานภาระกิจ คิดนอกกรอบ รับผิดชอบสังคม

ที่ ศธ ๖๓๙๓(๒๓)/ ๑๑๐๒

บัณฑิตวิทยาลัย มหาวิทยาลัยเชียงใหม่
๒๓๙ ถนนห้วยแก้ว ตำบลสุเทพ
อำเภอเมืองเชียงใหม่ ๕๐๒๐๐

๑๖ มีนาคม ๒๕๕๙

เรื่อง อนุญาตให้ใช้เครื่องมือวิจัย

เรียน คณบดีคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

อ้างถึง หนังสือที่ ศธ ๐๕๑๒.๑.๐๕/๐๕๙๖ ลงวันที่ ๒ มีนาคม ๒๕๕๙

        ตามที่ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ มีความประสงค์จะขออนุญาต
ให้ นางสาวพัชราวดี ทองเนื่อง นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาการพยาบาล นำเครื่องมือ
วิจัยในวิทยานิพนธ์ของ**คุณเอกรัตน์ ปิ่นประภาพันธ์** ไปใช้ในงานวิจัยนั้น

        บัณฑิตวิทยาลัย มหาวิทยาลัยเชียงใหม่ พิจารณาแล้วไม่ขัดข้อง และยินดีอนุญาต
ให้นำเครื่องมือดังกล่าวไปใช้ประโยชน์ในการศึกษาวิจัยได้

        จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(รองศาสตราจารย์ ดร.ทิพาพร วงศ์หงษ์กุล)
รองคณบดี ปฏิบัติการแทน
คณบดีบัณฑิตวิทยาลัย

งานบริการการศึกษา
โทร. ๐-๕๓๙๔-๒๔๑๐
โทรสาร. ๐-๕๓๙๔-๒๔๓๕

ที่ ศธ ๖๖๐๗/ ๐๕๒๙

คณะพยาบาลศาสตร์ มหาวิทยาลัยบูรพา
ต. แสนสุข อ. เมือง จ.ชลบุรี ๒๐๑๓๑

๑๖ มีนาคม ๒๕๕๙

เรื่อง   อนุญาตให้ใช้เครื่องมือเพื่อการทำดุษฎีนิพนธ์

เรียน   คณบดีคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

อ้างถึง   หนังสือที่ ศธ ๐๕๒๑.๑.๐๕/๐๕๙๗ ลงวันที่ ๒ มีนาคม พ.ศ. ๒๕๕๙

          ตามหนังสือดังอ้าง ท่านได้ขออนุญาตให้ นางสาวพัชราวดี ทองเนื่อง นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาการ
พยาบาล (หลักสูตรนานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ ใช้เครื่องมือวิจัย คือ แบบสอบถามพฤติ
กรรมการดำเนินชีวิตของผู้ป่วยโรคความดันโลหิตสูง ซึ่งเป็นส่วนหนึ่งของวิทยานิพนธ์เรื่อง "ปัจจัยที่มีความสัมพันธ์กับ
ความร่วมมือในการรักษาของผู้ป่วยความดันโลหิตสูงชนิดไม่ทราบสาเหตุ" ของ นายศักดิ์นรินทร์ หลิมเจริญ หลักสูตร
พยาบาลศาสตรมหาบัณฑิต สาขาวิชาการพยาบาลผู้ใหญ่ คณะพยาบาลศาสตร์ มหาวิทยาลัยบูรพา พ.ศ. ๒๕๕๙
เพื่อใช้ประกอบการทำดุษฎีนิพนธ์ ตามความทราบแล้วนั้น คณะฯ พิจารณาแล้ว อนุญาตให้ใช้เครื่องมือวิจัยดังกล่าวได้
โดยขอให้อ้างอิงผู้จัดทำเครื่องมือตามกฎหมายลิขสิทธิ์ด้วย

          จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(รองศาสตราจารย์ ดร.นุจรี ไชยมงคล)
คณบดีคณะพยาบาลศาสตร์

งานบริการการศึกษา (บัณฑิตศึกษา)
โทรศัพท์ ๐-๓๘๑๐-๒๘๐๘, ๐-๓๘๑๐-๒๘๓๖
โทรสาร   ๐-๓๘๔๓๙-๓๔๗๖

Re: Ask permission for using questionnaire

Richard Bagozzi <bagozzi@umich.edu>

Sun 8/14/2016 2:24 PM

To: PATCHARAWADEE TONGNUANG <tongnuang@wisc.edu>;

Dear Patcharawadee,

You are very welcome to use the questions we had on our questionnaire.

Unfortunately I no longer have the questionnaire stored somewhere and my co-author left academia many years ago and
also lost the questionnaire.

However I tried in the article to describe all items as fully as possible.

I would be glad to give you feedback on the questionnaire as your construct it.

In this way we should be able to recreate and construct a new questionnaire. I was the person who developed the questions in
the article, so I believe I can give good advice and be helpful.

Let me know if this is ok for you.

Best wishes and good luck with your research and education,

Richard

On Thu, Aug 11, 2016 at 5:37 PM, PATCHARAWADEE TONGNUANG <tongnuang@wisc.edu> wrote:

Dear Professor Richard P. Bagozzi

I am a PhD Student from Prince of Songkla University in Thailand

and I'm doing my dissertation about adult with hypertension.

I read your article about "Decision making and effort in the self-regulation of hypertension: Testing two competing theories" which were published in 2005

and I am interested your questionnaires that were mentioned in this article.

Therefore, I would like to ask permission your for using and translating language this questionnaire for my study. Some items may change words or sentence to fit with Thai people.

Could you please allow me to use and modify this questionnaire for my study?

Please let me know.

Best regards,

Patcharawadee

Patcharawadee Tongnuang

a PhD Student and a UWM visiting scholar

From Prince of Songkla University, Thailand

Mobile: 608-472-3849

tongnuang@wisc.edu

VITAE

Name   Patcharawadee Tongnuang

Student ID   5510430006

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing Science	Prince of Songkla University	2002
Master of Nursing Science	Chulalongkorn University	2007

Scholarship Awards during Enrolment

2015 - The best paper presentation award entitled "Influencing factors lifestyle modification behaviors in Thai adults with hypertension: A literature review " in More than 2 decades of Graduate Nursing Study May 16-17, 2015 at Faculty of Nursing, Prince of Songkla University, Hatyai campus, Songkhla, Thailand.

2017 - The best oral presentation award entitled "Factors influencing lifestyle modification behaviors in Thai adults with hypertension" at the 2017 International Conference on Ethics, Esthetics, and Empirics in Nursing: Driving Forces for Better Health July 5-7, 2017 at Prince of Songkla University, Hatyai Campus, Songkhla, Thailand.

Work – Position and Address

2002 to Present: Lecturer at Faculty of Nursing, Princess of Naradhiwas University, Narathiwat, Thailand 96000

List of Publication and Proceeding

2006 - Poster presentation: Predictor of smoking cessation among woman service workers, in The 5th Annual Conference of the International Society for the Prevention of Tobacco Induced Disease, Hong Kong, China.

2007 - Poster Presentation: Factor related to smoking cessation behavior among women service workers in Narathiwat Province, Thailand in the 6th Annual Meeting of the International Society for the Prevention of Tobacco Induced Diseases (ISPTID), Little Rock, Arkansas, USA.

2009 - Oral presentation: Role Perception of Educational Quality Assurance among Nursing Students, Faculty of Nursing, Princess of Naradhiwas University, Academic Year 2007 in the National Institutional Research Conference 2009, Bangkok, Thailand.

2010 - Oral Presentation: Effects of Student Centered Teaching Modules on Knowledge and Learner Development in Pathophysiology Subject among Nursing Students in the Lifelong Learning International Conference 2010 (3LInC'10), Kuala Lumpur, Malaysia.