FACTORS INFLUENCING ADHERENCE TO LOW SODIUM DIET IN PERSONS WITH HEART FAILURE

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ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย

นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาพยาบาลศาสตรดุษฎีบัณฑิต
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สินีนุช เสนีวงศ์ ณ อยุธยา : ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย. (FACTORS INFLUENCING ADHERENCE TO LOW SODIUM DIET IN PERSONS WITH HEART FAILURE) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร.จินตนา ยูนิพันธุ์, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ผศ. ดร.ชนกพร จิตปัญญา, 167, หน้า.

การวิจัยนี้มีวัตถุประสงค์เพื่อ พัฒนาและทดสอบโมเดลที่ใช้ในการอธิบายความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย กลุ่มตัวอย่างเป็นผู้ป่วยหัวใจวาย จำนวน 165 คน ที่มารับการตรวจรักษา ณ แผนกผู้ป่วยนอก/คลินิกโรคหัวใจ/คลินิกหัวใจวาย ของโรงพยาบาลรัฐจำนวน 6 แห่ง ในเขตภาคกลางของประเทศไทย ด้วยวิธีการสุ่มอย่างง่าย เครื่องมือที่ใช้ในการวิจัยประกอบด้วย แบบสอบถามข้อมูลส่วนบุคคล แบบประเมินทัศนคติ การคล้อยตามกลุ่มอ้างอิง การรับรู้ความสามารถในการควบคุมพฤติกรรมตนเอง แบบสอบถามความตั้งใจในการรับประทานอาหารโซเดียมต่ำ รวมทั้งแบบบันทึกอาหาร 3 วัน ซึ่งใช้ประกอบกับคู่มือคำแนะนำการบันทึกอาหารที่บริโภคในรอบ 24 ชั่วโมง สำหรับผู้ป่วยหัวใจวาย ซึ่งได้ผ่านการตรวจสอบความตรงตามเนื้อหาโดยผู้ทรงคุณวุฒิ และค่าความเที่ยงของเครื่องมือ เท่ากับ .89, .61, .78 และ .96 ตามลำดับ วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และสมการโครงสร้าง

ผลการวิจัย พบว่า โมเดลมีความสอดคล้องกับข้อมูลเชิงประจักษ์ (χ^2=164.96, df=150, P-value=0.19, RMSEA=0.000) ตัวแปรในโมเดลไม่สามารถอธิบายความผันแปรของความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวายได้ (R^2= .00, p>.05) ทัศนคติ การคล้อยตามกลุ่มอ้างอิง การรับรู้ความสามารถในการควบคุมพฤติกรรมตนเองไม่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำผ่านความตั้งใจ อย่างไรก็ตาม ตัวแปรในโมเดลสามารถร่วมกันอธิบายความผันแปรของความตั้งใจในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวายได้ 30% (R^2= .30, p<.05) ทั้งนี้ปัจจัยที่มีอิทธิพลต่อความตั้งใจในการรับประทานอาหารโซเดียมต่ำ มากที่สุด คือ ทัศนคติ ซึ่งมีอิทธิพลทางตรงต่อความตั้งใจในการรับประทานอาหารโซเดียมต่ำ(.38, p<.05) การคล้อยตามกลุ่มอ้างอิงไม่มีอิทธิพลต่อความตั้งใจในการรับประทานอาหารโซเดียมต่ำ(.16, p>.05) การรับรู้ความสามารถในการควบคุมพฤติกรรมตนเองมีอิทธิพลทางตรงต่อความตั้งใจในการรับประทานอาหารโซเดียมต่ำ (.18, p<.05) แต่ไม่มีอิทธิพลทางตรงต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำ (.02, p>.05) นอกจากนี้ยังพบว่า ความตั้งใจไม่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำ (.03, p>.05).

ข้อจำกัดของงานวิจัยนี้ ประกอบด้วย ขนาดกลุ่มตัวอย่างที่ค่อนข้างน้อย ปัจจัยด้านสิ่งแวดล้อมอื่นๆที่ไม่สามารถควบคุมได้ อาทิเช่น การเข้าถึงอาหารของผู้ป่วย การเลือกซื้ออาหารของครอบครัวผู้ป่วย เป็นต้น นอกจากนี้แบบบันทึกอาหาร 3 วันอาจไม่ใช่ตัวเลือกที่ดีในการศึกษาครั้งนี้ และอาจไม่เหมาะสมกับการใช้ในผู้ป่วยไทย

สาขาวิชา พยาบาลศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2556 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม .....

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SINEENUT SENIVONG NA AYUDHAYA: FACTORS INFLUENCING ADHERENCE TO LOW SODIUM DIET IN PERSONS WITH HEART FAILURE. ADVISOR: ASSOC. PROF. JINTANA YUNIBHAND, Ph.D., CO-ADVISOR: ASST. PROF. CHANOKPORN JITPANYA, Ph.D., 167 pp.

The purposes of this descriptive study were to develop and examine the causal relationships between variables including attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention to adherence to low sodium diet in Thai persons with heart failure. This study was conducted using The theory of planned behavior as the conceptual framework. The total of 165 persons with heart failure who returned back the 3-day food record were recruited. The data collection took place at the outpatient department and/or cardiac clinic of the 6 public tertiary care hospitals in central region of Thailand. Structured questionnaires were employed including a demographic questionnaire, The Dietary Sodium Restriction Questionnaire (DSRQ), Intention to adherence to a low sodium diet questionnaire, and a 3-day food record. Content validity was tested by the experts. Reliability of instruments was .89, .61, .78, and .96 respectively. Data were analyzed using descriptive statistic, and structural equation modeling.

The result revealed that the goodness of fit indices illustrated the adherence to low sodium diet model fit to the empirical data (χ^2= 164.96, df=150, P-value=0.19, RMSEA=0.000). The model could not explain the variance of adherence to low sodium diet in persons with heart failure (R^2= .00, p>.05). Attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control had no effects on adherence to low sodium diet through intention. However, the model explained 30% of the variance of intention among persons with heart failure (R^2= .30, p<.05). Attitude was the most influential factor affecting intention to adherence to low sodium diet (.38, p<.05). Subjective norms had no effect on intention (.16, p>.05). Perceived behavioral control had a direct effect on intention (.18, p<.05) but had no direct effect on adherence to low sodium diet (.02, p>.05). Additionally, intention had no direct effect on adherence to low sodium diet (.03, p>.05).

Limitation of this study included the too small sample size and other uncontrolled environment factors influencing adherence to low sodium diet at home, such as availability of food and food selection of family member, etc. Moreover, three day food record was not a good choice for this study and may not appropriate tool for data collection among Thai participants.

Field of Study: Nursing Science Student's Signature .....

Academic Year: 2013 Advisor's Signature .....

Co-Advisor's Signature .....

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CHAPTER I

INTRODUCTION

Background and significance of the study

Heart failure (HF) is not a disease itself. It is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood (Yancy et al., 2013). When diagnosed, heart failure patients are typically asked to change their health behaviors to follow the treatment regimen. Nowadays, therapy for heart failure typically includes both pharmacological and non-pharmacological treatment. According to recent guidelines, one of the essential non-pharmacological recommendations for heart failure patients is dietary sodium restriction (Bentley & Moser, 2007; Heart Failure Society of America, 2006; Swedberg et al., 2005; van der Wal & Jaarsma, 2008).

Adherence to a low sodium diet refers to the extent to which a patient's behavior conforms to the prescribed dietary regimen (Sabate, 2003). Attributes of adherence include alignment of patient behavior with health recommendations, mastery of new behavior and health knowledge, and perceived ability to meet outcome targets (Cohen, 2009; Ingram, 2009). How closely heart failure patients adhere to a low sodium diet can be assessed by using subjective or objective measurements such as a self-report adherence questionnaire, 24-hour urine sodium excretion, day food diaries, and 24-hour dietary recalls (Long, 2007; Maclntyre, 2009; Sauberlich & 1999). Each measurement has its own advantages and disadvantages. For instance, in the health literature, to increase the accuracy of adherence to low

sodium diet assessment, 24-hour urine sodium excretion is accepted (Chung et al., 2006; Lennie et al., 2008; Song, 2009; Yancy & Boan, 2006). A food record can also reflect sodium intake in heart failure patients.

Dietary sodium restriction is commonly recommended to persons with heart failure and is endorsed by many guidelines (Heart Failure Society of America, 2010; Yancy et al., 2013; McMurray et al., 2012). Researchers have documented sodium-intake limits for the average heart failure patients. In general, a two-gram sodium diet is frequently recommended for heart failure patients (Grady, Kathleen, et al., 2000). Several practices have suggested limiting sodium to a maximum of three grams per day for mild to moderate heart failure, while patients with severe heart failure are limited to less than two grams of sodium per day (Grady, Kathleen, et al., 2000; House-Fancher & Foell, 2004). Furthermore, the current guideline from the Heart Failure Society of America recommends that for mild heart failure patients, a low sodium diet should contain less than three grams of sodium per day and less than two grams for patients with moderate to severe heart failure (Heart Failure Society of America, 2006). However, a three-gram-per-day restriction may be a more realistic goal for patients with mild to moderate heart failure (Grady, Kathleen, et al., 2000; House-Fancher & Foell, 2004).

Some studies have demonstrated that fluid overload secondary to excessive dietary sodium intake is the most common reason for rehospitalization (Bennett et al., 1998; Michalsen, 1998; Opasich et al., 2001; Tsuyuki et al., 2001). Moreover, symptom exacerbation occurs if the patients do not adhere to a low sodium diet (Bennett et al., 1998; Tsuyuki et al., 2001; Vinson, Rich, Sperry, Shah, & McNamara, 1990; Welsh et al., 2002). It can be seen that poor adherence to a low sodium diet

has been associated with the exacerbation of symptoms, increased hospitalizations and predicted hospital readmissions (Bennett et al., 1998; Evangelista et al., 2003; Evangelista, Berg, & Dracup, 2001). At least 50% of hospital readmissions can be prevented by adherence to a low sodium diet (Kimmelstiel, 1995).

Generally, heart failure patients received the low sodium diet recommendations before discharge from the hospital. However, adherence to a low-sodium diet is still poor. Adherence rates have been reported to be between 22% to 70% (Bennett et al., 1998; Evangelista et al., 2003; Evangelista et al., 2001; Happ, Naylor, & Roe-Prior, 1997; Kravitz et al., 1993; Michalsen, 1998). Only about 40% of the patients in one study had a daily sodium intake that was less than three grams (Lennie et al., 2008).

In addition, some heart failure patients may adhere to a low sodium diet during the first stage after discharge only. Similarly, some heart failure patients adhere to a low sodium diet intermittently. In one study, 18% of heart failure patients always followed their low-sodium diet and 57% of the patients usually followed the prescribed diet. Furthermore, 21% of the patients followed the diet sometimes and 4% of the patients never followed the low-sodium diet. A total of 54% of these patients stated that it was hard or very hard to follow the low-sodium diet (Lennie et al., 2008).

Additionally, heart failure patients described adherence to low sodium diet as “work.” They perceived the nature of this work as “frustrating” and “depending” on others (Granger, Sandelowski, Tahshjain, Swedberg, & Ekman, 2009). For instance, restricting dietary sodium required “thinking” about grocery shopping and “deciding to choose” correctly, in addition to simply knowing what to choose. Patients have

reported reasons why they cannot adhere to low sodium diet as being poor taste, eating alone, lack of knowledge about dietary sodium in general, lack of availability of foods that are low in sodium, difficulty eating at restaurants and at social activities, preparation time, and cost (Bennett et al., 1998; Sheahan & Fields, 2008).

Over the years, a number of social cognition theories or models have been proposed to account for individual differences and variations in health behavior (Griva, Anagnostopoulos, & Madoglou, 2010). The theory of planned behavior (TPB) is one of the well-known models that has been received attention and has been applied as the theoretical framework for many empirical studies concerning health-related behaviors both in nursing and psychology discipline.

The theory of planned behavior (TPB) is an extension of the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). Because the theory of reasoned action is limited to the prediction of such behaviors under full volitional control, the notion of perceived control is included in order to explain behaviors under partial volitional control (Ajzen, 1985). TPB composes of four core constructs which are attitude toward behavior, subjective norms, perceived behavioral control (PBC), and behavioral intention. Attitude toward behavior, subjective norms, and perceived behavioral control are major independent antecedents of behavioral intention, while intention is an intermediate determinant of target behavior. The TPB proposes that individuals' intention to engage in a certain behavior is strong when they have positive attitudes toward such behavior; they believe that the persons significant to them think they should do the behavior; and they think that they can do the behavior. Over the past 10 years, the TPB has been tested in many health-related

behavior such as smoking behavior, exercise behavior, eating behavior, condom used behavior, screening behavior and so on.

According to theory of planned behavior, attitude towards adherence to low sodium diet, subjective norms, perceived behavioral control and behavioral intention affect adherence to low sodium diet.

Attitude is one of the factors that influence behavior. Attitude refers to the patient's beliefs about outcomes of performing a behavior (Ajzen, 2005). van der Wal et al. (2006) examined all dimensions of compliance and its related factors in 501 heart failure patients. The findings revealed that compliance was related to knowledge, beliefs, and depressive symptoms. If the patients have a positive belief about the outcome of performing behavior, they will engage in performing that behavior (Ajzen, 2005).

Another factor that influences adherence to low sodium diet in heart failure patients is subjective norms. A patient's belief about what their important referents (health-care providers and family members) think of following or not following a low-sodium diet affects that patient's ability to engage in a behavior (Ajzen, 2005). This means if the referent approves or supports a heart failure patient's performing dietary sodium restriction behavior, that patient will be more likely to adhere to low sodium diet restriction (Fishbein & Ajzen, 2010).

Patients perceive the nature of adherence to a low-sodium diet to be "frustrating" and "depending" on others (Granger et al., 2009). Persons with heart failure may not prepare their diet by themselves. Sheahan & Fields (2008) found that "eating alone" was one of the barriers to adherence to a sodium-restricted diet (SRD) in persons with heart failure. Among participants who stated that they adhered to an

SRD, concern for their family members was the strongest motivator and major theme. Two of the factors identified as affecting adherence to low sodium diet included social pressure and encouragement from others. A barrier to following a low sodium diet was lack of support from friends and family (Heo, Lennie, Okoli, & Moser, 2009).

Patient behaviors have been shown to be affected by their perception of the degree to which they can control or even perform behavior and can overcome barriers (Ajzen, 2005). This is called perceived behavioral control. For persons with heart failure, if they perceive that they have some control over adherence to low sodium diet, can overcome barriers, or can perform desired behavior, they will engage in adhering to a low sodium diet. Simply put, the ease or difficulty of adherence to low sodium diet can affect heart failure patients' adherence. Evangelista et al. (2003) revealed that of 70 elderly heart failure patients, 37% had difficulty following their prescribed diet. Likewise, findings showed an inverse relationship between perceived difficulty following and compliance with all prescribed regimens: the more difficulty, the less compliance. Reasons for difficulty following diet included lack of motivation and lack of self-control.

A mediating factor, according to the theory of planned behavior, is behavioral intention (Ajzen, 2005). Attitude, subjective norms, and perceived behavioral control have an indirect effect on targeted behavior through a factor called intention (Ajzen, 2005). A literature review revealed no study about the association between intention and adherence to low sodium diet in persons with heart failure.

Furthermore, an intervention study was conducted to improve adherence to low sodium diet in heart failure patients. Arcand et al. (2005) conducted a

randomized control trial to evaluate the effect of dietitian education on adherence to sodium-restricted diet in ambulatory patients with stable heart failure. Forty-seven consecutive heart failure patients were included in this study. The results showed that dietitian education significantly decreased in sodium intake at three months in the experimental group, whereas there was no change in sodium intake in the usual-care group.

In addition, Dunbar et al. (2005) compared the effects two interventions, a patient and family education (EDUC) intervention and a combined education and family partnership intervention (EDUC + FPI), on improving dietary sodium self-management in heart failure patients. Patients with heart failure and a family member (FM) were randomized to each intervention. Self-reported dietary sodium (Diet Na) intake and 24-hr urinary sodium (Urine Na) were measured at baseline (BL) and three months (3M) after intervention. The result showed that both groups decreased Diet NA and Urine NA from BL to 3M, but the EDUC + FPI group showed greater decrease in Urine NA and had a greater percentage of those who decreased Urine NA by at least 15%. Regression analysis to predict Urine NA revealed a significant Group × Time interaction when accounting for time-varying measures of body mass index (Dunbar et al., 2005).

Researchers in Thailand conducted studies of therapeutic compliance in heart patients. Pasunant (1986) investigated the relationship between health beliefs, self-care knowledge and therapeutic compliance in 100 ischemic heart patients. The results revealed a positive relationship between self-care knowledge and therapeutic compliance. No significant differences of compliance appeared among groups different in sex, age, educational level, and economic status. Krervanichkit (1988)

conducted research to explore relationships between selected factors (knowledge concerning illness and self-care, health beliefs and therapeutic compliance behavior) in 100 congestive heart failure patients. Findings showed a positive relationship between economic status, knowledge, health beliefs and compliance behavior. No significant relationships were found between age, sex, marital status, education level, occupation, and compliance behavior.

Empirical testing of theory is intended to give more information about concepts and their usefulness in nursing practice (Chinn & Kramer 1999, Hardy 2004, Meleis 2005, McEwen 2007). Although the theory of planned behavior has been tested over years, most of the previous evidence was conducted mainly among Western populations which have different culture from Thailand. Culture differences can lead to different believe and health behaviors of the patients.

Western culture and Asian culture have some differences. For example, self-representation is affected by culture. The individualized self of Americans, which is characterized by inner representational organization, emphasizes an individualistic "I-ness" with sharp differentiation between inner images of self and others, and considerable social individuation. On the other hand, Asians have created a sense of self that is much more inclusive of "we-ness," and have a closer interconnection of inner images between self and others (Nilchaikovit, Hill, & Holland, 1993). As a result, Americans are more self-confident and courageous doing something that deviates from group consensus, whereas Asians have an awareness of social context and, before making any decision, are concerned about the views of other persons, such as friends, family, and co-workers. Consultation with family members is important in making decisions (Davidson et al., 2007). Therefore, Americans may be more self-

confident in changing their health behaviors due to recommendations than Asians, who may need more motivation or support from family and relatives in order to modify behaviors.

The concept of family in America and Asia is also different in some aspects, such as role of family in illness. Asians view problems such as a patient's illness as the family's problem rather than just the individual's problem. For this reason, Asian families seem to be overinvolved or try to take over responsibilities and make decisions for the patient (Nilchaikovit et al., 1993). On the other hand, family involvement has been found to enhance patient compliance. In Asian cultures when a person is sick, family members will take turns as caretaker and stay with the patient around the clock, if possible. It is also not uncommon that the family will try to take care of the patient in a way that may seem "infantilizing" from an American viewpoint, such as spoon-feeding the sick person (Nilchaikovit et al., 1993). This may be rarely found in the American context. Asian patients might look different from American patients because the former may need more motivation support to change behavior. Their families might take a bigger role in management, allowing them to be more dependent.

Another difference between American culture and Asian culture is food and a particular kind of taste. The Thai National Statistical Office (2005) found that approximately 12% of Thai adults love to eat salty foods. In addition, many traditional Thai dishes consist of vegetables. Thais buy foods at the open-air market where most of the food packages have no nutrition label. This is different from Americans. Many kinds of food have salty taste. Besides, generally, grocery stores are the main source of food in the U.S., so American people can look for the nutrition

they want on the package's label. Therefore, it is more difficult for Thai persons with heart failure to select appropriate foods.

Asian patients might look different because they may need more motivation support to change behavior. Family might take a bigger role in management allowing patients to be dependent. These basic differences between Americans and Asians can affect the ways patients believe and behave. Therefore, the TPB which mainly tested among Western populations may be not suitable for Thai context. The theory should be tested in Thai persons with heart failure. The findings can be used for understanding patients' behaviors.

Additionally, according to the literature review, in Thailand, there was no study that directly focused on adherence to low sodium diet in persons with heart failure. Besides, it should be recognized that what is known about adherence to low sodium diet in persons with heart failure is based on inquiries within Western culture. As a result, factors influencing adherence to low sodium diet which have been explored based on data from Western populations may not be appropriate for Eastern populations such as in Thailand.

In conclusion, studies have shown that numerous factors relate to and affect adherence to low sodium diet in heart failure patients. However, these studies had limitations such as small sample size and low quality of some part of the measures (Evangelista et al., 2003), and only one setting collecting data (Krervanichkit, 1988; Pasunant, 1986). Additionally, some of the studies focused on dietary behaviors but not directly on adherence to a low sodium diet. Most of the prior studies have been designed to test descriptive levels; as a result, the direct and indirect influences of important determinant are unclear. Subsequently, understanding the causality of

these variables and their effect on adherence to low sodium diet in the entire model is also required. Information about causality of the variables and adherence to low sodium diet can guide clinical nurses and researchers to develop specific and effective interventions in order to improve adherence to low sodium diet in persons with heart failure at hospital, community, and national levels. In terms of the nursing profession, this research helps broaden knowledge concerning adherence to low sodium diet.

Research question

1. Does attitude toward adherence to low sodium diet have an indirect effect on adherence to low sodium diet through intention?

2. Does subjective norms have an indirect effect on adherence to low sodium diet through intention?

3. Does perceived behavioral control have a direct effect on adherence to low sodium diet and have an indirect effect on adherence to low sodium diet through intention?

4. Does intention have a direct effect on adherence to low sodium diet in Thai persons with heart failure?

5. Does the hypothesized causal model explaining adherence to low sodium diet among Thai persons with heart failure in view of their attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention adequately fit the data?

Purpose of the study

1. To develop a causal model to explain adherence to low sodium diet in Thai persons with heart failure taking into consideration the significance of attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention.

2. To examine the causal relationships between variables including attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention on adherence to low sodium diet in Thai persons with heart failure.

Research hypotheses

This study was guided by the Theory of Planned Behavior (TPB) and supported by evidence from the literature review. The hypotheses are stated as follows:

1. Attitude toward adherence to low sodium diet has a positive indirect effect on adherence to low sodium diet in Thai persons with heart failure through intention.

Attitude is determined by the individual's beliefs about outcomes of performing the behavior (behavioral beliefs) weighted by evaluations of those outcomes (Ajzen, 2005; Montano, 2008). Thus, if patients hold strong beliefs that performing a behavior leads to valuable outcomes, those patients will have a positive attitude toward that behavior. As a result, the patients intend to perform and engage in performing that behavior. Several studies showed that attitude influences adherence to low sodium diet in persons with heart failure (Ajzen, 2005; Montano, 2008).

2. Subjective norms has a positive indirect effect on adherence to low sodium diet in Thai persons with heart failure through intention.

Subjective norms is determined by the patient's normative beliefs, which are whether important referent individuals approve or disapprove of performing the behavior, weighted by the patient's motivation to comply with those referents (Ajzen, 2005; Montano, 2008). Patients who believe that the referents think they should perform the behavior and are motivated to meet expectations of those referents will hold positive subjective norms. Thus, behavioral intention will be increased and lead the patient to engage in performing the behavior. Several researchers have found that family help or support, which indicates approval from important referent individuals, is the major facilitator of adherence to low sodium diet in heart failure patients (Artinian, Magnan, Sloan, & Lange, 2002; Granger et al., 2009; Sabate, 2003; Sheahan & Fields, 2008).

3. Perceived behavioral control has a positive direct effect on adherence to Low sodium diet in Thai persons with heart failure and has a positive indirect effect on adherence to low sodium diet through intention.

Perceived behavioral control refers to the patients' perception of control over behavioral performance, together with intention. Perceived behavioral control has been shown to have a direct effect on behavior (Ajzen, 2005; Montano, 2008). If the patients perceive that they can do a behavior and it is not hard to do, they will perform that behavior. This construct is similar to self-efficacy. Studies show the influence of perceived behavioral control on intention and adherence to low sodium diet in heart failure (Chaweewan Jitsacorn, 2000; Haobin, 2000; Oka, Gortner, Stotts, & Haskell, 1996; Pothikanun, 2000).

4. Intention has a positive direct effect on adherence to low sodium diet in Thai persons with heart failure.

According to the TPB, intention positively affects adherence to low sodium diet: The more intention, the more performance of the activity (I. Ajzen, 2005; Montano, 2008). However, none of the studies was conducted to describe the relationship of intention to adherence to low sodium diet in heart failure patients. Therefore, intention is explored in this study.

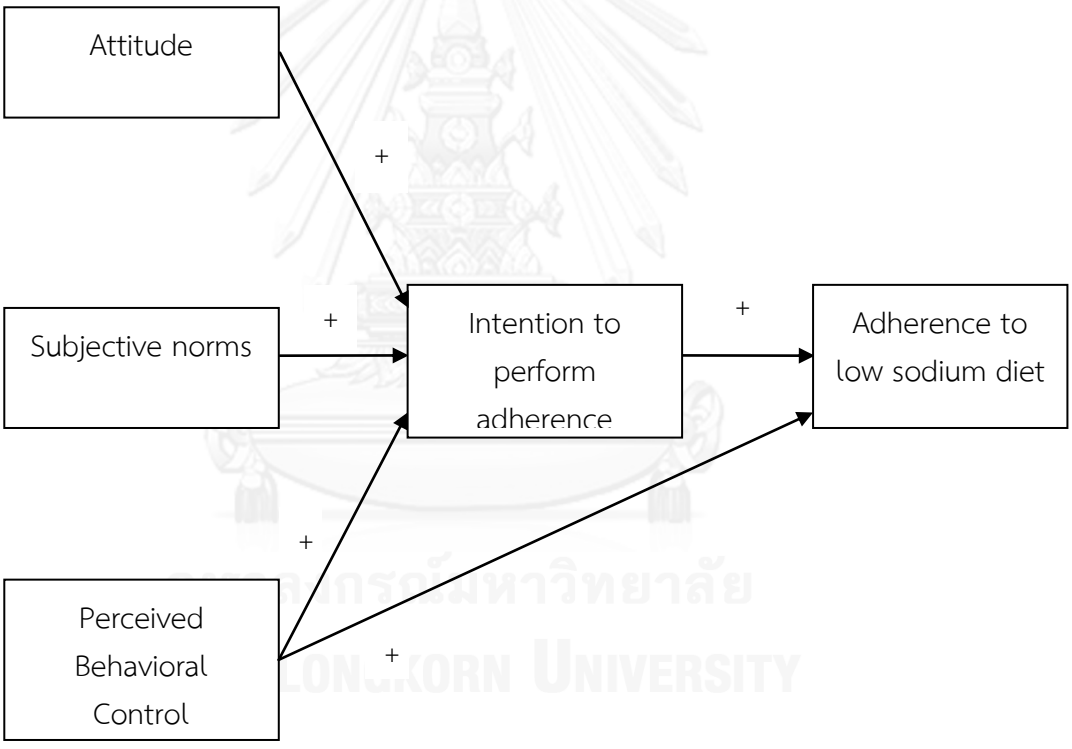

Figure 1 Hypothesized model of adherence to low sodium diet in Thai persons with heart failure

Scope of the study

This study is a descriptive correlational research approach, designed to develop and examine the causal model of adherence to low sodium diet in Thai persons with heart failure. The participants were 165 persons living with heart failure who are 18 years old and over, diagnosed with heart failure or used to have clinical heart failure symptoms, healthcare providers recommended that the persons follow a low sodium diet, and have no other critical conditions or serious complications. This study was conducted at 6 tertiary care hospitals in the central region of Thailand. The data collection was done between January to June 2014.

Operational definitions

Adherence to low sodium diet refers to the heart failure patient's behavior conforms to the prescribed low sodium diet regimen: limiting sodium to a maximum of 3 grams per day for mild to moderate heart failure and less than 2 grams of sodium per day for severe heart failure patients. It was measured by using a 3-day food record modified from food record which developed by Chittchang et al (2000). Level of sodium intake per day was analyzed from 3-day food record using INMUCAL program. Level of sodium intake per day reflected adherence to low sodium diet in negative direction. The more sodium intake, the less adherence to low sodium diet.
In this study, the participants were categorized into two groups which were adherence group and non-adherence group based on their sodium intake level. The participants in each NYHA level were non-adherence if their intake more sodium than their prescribed low sodium diet regimen.

Intention refers to heart failure patient's willingness or commitment to limiting sodium as prescribed in the dietary sodium regimen from the health care

provider. It was measured by using a questionnaire developed by the researcher according to the Theory of Planned Behavior and literature review.

Attitude toward adherence to low sodium diet refers to heart failure patients' perceptions about outcomes of adherence to low sodium diet. It was measured by using The Dietary Sodium Restriction Questionnaire (DSRQ): attitude subscale which is developed by (Bentley, 2006).

Subjective norms refers to heart failure patients' perceptions about help, support, and approval from important referents such as family and health care providers for adhering to low sodium diet. It was measured by using The Dietary Sodium Restriction Questionnaire (DSRQ): subjective norms subscale which is developed by Bentley et al. (2006).

Perceived behavioral control refers to heart failure patients' perceptions about the degree to which they have control over adherence to low sodium diet, can overcome barriers to adherence to low sodium diet, or can adhere to low sodium diet behavior. It was measured by using The Dietary Sodium Restriction Questionnaire (DSRQ): perceived behavioral control subscale which is developed by Bentley et al. (2006).

Expected benefits of the study

1. This study will provide greater understanding about causal relationships among the selected variables in persons with heart failure.

2. The information from this study may be useful in planning appropriate nursing interventions for persons with heart failure. Nurses can use the findings of this study to develop research and nursing interventions in order to enhance the adherence to low sodium diet of Thai persons with heart failure.

CHAPTER II

LITERATURE REVIEW

This chapter presents an integrated review of theoretical and empirical literatures describing concepts of the interest and interrelationship among them. The review consists of the following.

1. Heart failure
    - 1.1 Definition of heart failure
    - 1.2 Causes of heart failure
    - 1.3 Diagnosis of heart failure
    - 1.4 Pathophysiology of heart failure
    - 1.5 Incidence of heart failure
    - 1.6 Burdens and impacts of heart failure
    - 1.7 Management of heart failure
2. Sodium and heart failure
    - 2.1 Sodium
    - 2.2 Effect of sodium on heart failure
    - 2.3 Sources of sodium
    - 2.4 Sodium Intake
3. Adherence to low sodium diet
    - 3.1 Definition of adherence to low sodium diet
    - 3.2 Measurement of adherence to low sodium diet
4. Adherence to low sodium diet in heart failure patients
5. Cultural differences between western and Asian countries

6. Theoretical framework: The Theory of Planned Behavior (TPB)

7. Factors influencing adherence to low sodium diet in heart failure patients

8. Conceptual Framework

Heart failure

1. Definition of heart failure

Although heart failure (HF) has many definitions, the most familiar meaning of heart failure is a physiological state in which the heart fails to pump sufficient blood to meet the metabolic requirements of the body (Swedberg et al., 2005). Furthermore, heart failure is recognized as a clinical syndrome characterized by signs and symptoms of fluid overload or of inadequate tissue perfusion (Hunt et al., 2001; Smeltzer, Bare, Hinkle, & Cheever, 2008) It is caused by a variety of functional or structural disorders of the heart that weakens its pumping performance (Cowie & Zaphiriou, 2002; Grady, 1999). On other words, heart failure occurs as a result of myocardial damage (Ide, 2002). The most common causes of heart failure are related to valular heart disease, coronary artery disease, cardiomyopathy, and ventricular dilatation. HF is actually a complication of other cardiovascular conditions, rather than a disease in itself.

Moreover, heart failure has been termed the “merry-go-round” disease because of the well-known cycle of worsening symptoms, hospital admission, discharge home, followed by worsening symptoms and repeat of the same cycle. The patient is initially functional, worsens, is hospitalized and is discharged (usually not in as good a condition as when first stricken) only to repeat this cycle (Peacock, 2006). According to this cycle, heart failure patients will worsen, ending, usually within 5 years, with their death.

There are two types of heart failure: diastolic heart failure and systolic heart failure, categorized by assessment of left ventricular functioning using an echocardiogram. The patients who have a predominant abnormality in diastolic function, with a normal or preserved ejection fraction are considered to have diastolic heart failure (Piano, 2008). Another type of heart failure, systolic heart failure, is defined as an inability of the left ventricle to contract against a load and eject blood volume into the aorta. As a result, stroke volume and ejection fraction are reduced (Piano, 2008). The left ventricular ejection fraction (LVEF) is normal in diastolic heart failure but severely reduced in systolic heart failure. Systolic heart failure usually has an LVEF of less than 40% whereas diastolic heart failure has an LVEF of greater than 40% (Smeltzer et al., 2008). Additionally, heart failure can be divided into left- and right-sided ventricular failure; these two types can occur independently or together (Ide, 2002).

In terms of the severity of heart failure, the New York Heart Association (NYHA) classifies the severity of heart failure into four levels according to the symptoms described in Table 1 (Chavey et al., 2001; Friedlander, 2005; Smeltzer et al., 2008). Patients with NYHA Class I may have a history of heart failure symptoms but be currently asymptomatic. NYHA Class II indicates patients with symptoms of heart failure only at levels of more than ordinary activity, while NYHA Class III represents patients with symptoms of heart failure that occur at levels of less than ordinary activity. For NYHA Class IV patients, symptoms of heart failure can occur at rest (Hoyle & Kahl, 2006). This clinical classification has been useful not only in assessing prognosis in patients with heart failure but also in determining treatment and resources needed for management.

Table 1 The New York Heart Association (NYHA) Classification of Heart failure

Class	Symptoms	Prognosis
I	- Ordinary physical activity does not cause undue fatigue, dyspnea, palpitations, or chest pain - No pulmonary congestion or peripheral hypotension - Patient is considered asymptomatic - Usually no limitation of activities of activity daily living (ADLs)	Good
II	- Slight limitation on ADLs - Patient reports no symptoms at rest, but increased physical activity will cause symptoms - Basilar crackles and S3 murmur may be detected	Good
III	- Marked limitation on ADLs - Patient feels comfortable at rest, but less than ordinary activity will cause symptoms	Fair
IV	- Symptoms of cardiac insufficiency at rest - Unable to carry out any physical activity without discomfort	Poor

Due to recent advances in diagnostic technology, the presence of asymptomatic left ventricular dysfunction, which is defined as decreased ventricular function with few or no overt clinical signs or symptoms (Class I), has increased. As a result, since 2001, the American College of Cardiology/American Heart Association(ACC/AHA) have proposed in their latest guidelines a heart failure staging system that takes into consideration a patient's clinical characteristics, including presymptomatic stages as shown in Table 2 (Funk & Winkler, 2008; Hoyle & Kahl, 2006; Smeltzer et al., 2008).

Table 2 The American College of Cardiology/American Heart Association (ACC/AHA) Staging of Heart failure

Stage	Definition	Characteristics	Therapy	Functional class
A	At high risk for HF* but without structural heart disease or symptoms of HF	Patients with: HT, DM, PVD, CVA, patients on toxins, FHx history of CM	-treat HT, lipid disorders -encourage regular exercise/optimize weight -smoking cessation -address alcohol intake, detrimental drug use -ACEi in appropriate patients	N/A
B	Structural heart disease but without symptoms of HF	Patients with: Previous MI, LV systolic dysfunction, Asymptomatic valvular disease	-All stage A treatment and: -ACEi in proper patients -Beta-blockers in appropriate patients -ICDs in proper patients	I
C	Structural heart disease with prior or current symptoms of HF	Patients with: Known structural heart disease, shortness of breath and fatigue, reduced exercise tolerance	-All stage A, B treatment and: -Lifestyle changes -Drugs for routine use: ACEi /ARBs, Beta-blockers, Aldosterone, Diuretics, Digitalis -Consider ICDs/Bi-v pacers, surgery	II-III
D	Refractory HF requiring specialized interventions	Patients with "symptoms at rest" despite maximal medical therapy	-All stage A, B, C treatment -Consider mechanical assist and heart transplantation, continuous IV inotropes for palliation, Hospice care	III-IV

Note. HF = heart failure; HT = hypertension; DM = diabetes mellitus; PVD = peripheral vascular disease; CVA = cerebrovascular accident; FHx = family history; CM = cardiomyopathy; ACEi = angiotensin converting enzyme inhibitors; MI = myocardial infarction; LV = left ventricular; ICD = implantable cardioverter-defibrillators; ARB = angiotensin receptor blockers.; Bi-v = biventricular.; IV = intravenous

2. Causes of heart failure

Heart failure can be considered a syndrome caused by a wide variety of disorders of the cardiovascular system affecting the myocardium, the cardiac valves, coronary circulation, and the pericardium (Hoyle & Kahl, 2006). It is often a symptom of another cardiovascular problem that causes either systolic or diastolic dysfunction with reduced ventricular filling and reduced myocardial contractility (Resnick, 2004). Nevertheless, the causes of heart failure can be categorized into four groups, which are myocardial, volume-related, pressure loading, and restrictive. Myocardial causes of heart failure include ischemia resulting from coronary artery disease (CAD) and chamber dilatation that can be idiopathic or caused by toxins, inflammation, or pregnancy. Disorders causing volume changes, such as aortic and mitral regurgitation and anemia, can also cause heart failure. Conditions resulting in pressure loading of the left ventricle also lead to heart failure. Hypertension and aortic stenosis are in this group. Restrictive conditions including constrictive pericarditis, amyloidosis, and sarcoidosis are more common causes of heart failure in less-developed areas of the world (Funk & Winkler, 2008; Hogg, Swedberg, & McMurray, 2004). Of all these possible causes, the most common cause of heart failure is CAD, producing ischemic cardiomyopathy, the most frequent cause of left ventricular systolic dysfunction (Bennett et al., 2000; Chavey et al., 2001; Funk & Winkler, 2008; Moser, Macho, & Worster, 2000). Coronary artery disease appears to account for 60% to 70% of the systolic heart failure incidence in developed countries (Hellermann et al., 2002). In addition, hypertension is one of the most common conditions leading to heart failure development (Funk & Winkler, 2008). The other causes of heart failure are non-ischemic cardiomyopathy, which may have an identifiable cause such as thyroid

disease, valvular disease, or myocarditis or may have an unknown cause such as idiopathic dilated cardiomyopathy(Hunt et al., 2005). One study showed that younger patients developed heart failure from congenital heart diseases and rheumatic heart disease whereas older patients developed the disease from cardiac muscle impairment such as myocardial infarction (MI) (Sritama et al., 2004).

3. Diagnosis of heart failure

The diagnosis of heart failure depends on sound clinical judgment based on a combination of the signs and symptoms present and some specific tests (Swedberg et al., 2005). Nowadays, heart failure is assessed by using procedures such as electrocardiography, transthoracic echocardiography, exercise stress-testing, and cardiac catheterization. An electrocardiogram is generally used to determine whether ischemic heart disease is likely, and this test can also provide information about rhythm abnormalities (Remme & Swedberg, 2001; Swedberg et al., 2005).

Transthoracic echocardiogram not only provides diagnostic information readily and safely but also gives useful information about ventricular function, chamber size and shape, wall thickness and valvular function(Remme & Swedberg, 2001; Swedberg et al., 2005).

4. Pathophysiology of heart failure

Heart failure, sometimes referred to as pump failure, is a general term for the inability of the heart to work effectively as a pump (Ignatavicius & Walicek, 2010; Lutz & Przytulski, 2006; Rolfes, Pinna, & Whitney, 2006). Two ventricles of heart represent two separate pumping systems; therefore, it is possible for one to fail by itself for a short period (Ignatavicius & Walicek, 2010). Mostly heart failure begins with failure of the left ventricle and progresses to failure of both ventricles (Ignatavicius & Walicek,

2010). Decreased tissue perfusion from poor cardiac output and pulmonary vessels indicate left ventricular failure (LVF).

When cardiac output is insufficient to meet the demands of the body, compensatory mechanisms operate to improve cardiac output. Although these mechanisms may initially increase cardiac output, they eventually have a damaging effect on pump function. Major compensatory mechanisms include: stimulation of the sympathetic nervous system, renin-angiotensin system (RAS) activation, other chemical responses, and myocardial hypertrophy (Ignatavicius & Walicek, 2010).

In heart failure, when tissue hypoxia occurs, sympathetic nervous system stimulation is the most immediate compensatory mechanism. Adrenergic receptors are stimulated and cause an increase in heart rate (beta adrenergic). In addition, blood pressure is increased by vasoconstriction (alpha adrenergic) (Ignatavicius & Walicek, 2010; Lutz & Przytulski, 2006). Consequently, cardiac output immediately increases. However, the heart beat has its own limitation for compensation. If the heart beat becomes too rapid, diastolic filling time is limited and cardiac output may start to decline. Furthermore, an increase heart rate also significantly increases oxygen demand by the myocardium. Heart failure may worsen in case of poor perfusion of heart (Ignatavicius & Walicek, 2010).

Sympathetic stimulation increases venous return to heart, which further stretches the myocardial fibers causing dilation. According to Starling's law, increased myocardial stretch results in more forceful contraction. More forceful contraction increase stroke volume and cardiac output (Ignatavicius & Walicek, 2010). After a critical point is reached within the cardiac muscle, further volume and stretch reduce the force of contraction and cardiac output.

Arterial vasoconstriction is caused by sympathetic stimulation. This has the benefit of maintaining blood pressure and improving tissue perfusion in low-output states. However, constriction of the arteries increases afterload, the resistance against which the heart must pump. Afterload is the major determinant of myocardial oxygen requirements. As it increases, the left ventricle requires more energy to eject its contents and stroke volume may decline (Ignatavicius & Walicek, 2010).

Other compensation is renin-angiotensin system activation. In low-output states, reduced blood flow to the kidneys is commonly occurred. This activates the renin-angiotensin system (RAS). Vasoconstriction becomes more pronounced in response to angiotensin II, and aldosterone secretion causes sodium and water retention (Hoyle & Kahl, 2006; Ignatavicius & Walicek, 2010; Lutz & Przytulski, 2006). Preload and afterload increase. Angiotensin II contributes to ventricular remodeling resulting in progressive myocyte (myocardial cell) contractile dysfunction over time (Ignatavicius & Walicek, 2010; McCance & Huether, 2006).

Another compensatory mechanism is myocardial hypertrophy, enlargement of the myocardium. The walls of the heart thicken to provide more muscle mass, which results in more forceful contractions, further increasing cardiac output (Ignatavicius & Walicek, 2010). Cardiac muscle, however, may hypertrophy more rapidly than collateral circulation can provide adequate blood supply to the muscle. Often a hypertrophied heart is slightly oxygen deprived.

All the compensatory mechanisms contribute to an increase in the consumption of myocardial oxygen. When the demand for oxygen increases and the myocardial reserve has been exhausted, clinical manifestations of heart failure develop (Ignatavicius & Walicek, 2010).

5. Prevalence of heart failure

Heart failure, a physiological state in which the heart fails to pump sufficient blood to meet the metabolic requirements of the body, is not only the most frequent diagnosis of cardiovascular hospitalizations but also a leading cause of death in cardiac patients (Nesbitt, 2008). In the United States, more than five million people have been diagnosed with heart failure, and 550,000 cases occur annually, accounting for more than one million hospitalizations and 285,000 deaths (Artinian, 2003; Ho, Anderson, Kannel, Grossman, & Levy, 1993; Rosamond, Howard, & Thom, 2007). Besides, the mortality rates of heart failure are still as high as 10% to 20% within the first year after onset of symptoms and nearly 50% within five years (Ho et al., 1993; Jessup, 2003).

In Thailand, the prevalence of heart disease has gradually increased. The rate per 1,000 cases in 2006 was 221.20. In 2007, it was 255.76, and in 2008 were 283.78. (Bureau of Policy and Strategy & Ministry of Public Health, 2009). Moreover, the mortality rate of heart diseases from 2003 to 2007 are 27.7, 26.8, 28.2, 28.4, and 29.3 per 100,000 cases, respectively (Bureau of Policy and Strategy & Ministry of Public Health, 2009). In 2003, data showed that 70% of all cardiac deaths in Thailand were attributed to heart failure (Heart Association of Thailand, 2009).

6. Burdens and impacts of heart failure

Heart failure leads to many burdens. It is one of the highest-cost cardiovascular diseases. The annual direct and indirect costs of heart failure are estimated to exceed $33 billion in the United States and accounted for 1% to 2% of all healthcare expenditures in developed countries (Berry, Murdoch, & McMurray, 2001; Rosamond et al., 2007). In most countries, expenditure related to heart failure has increased twofold to threefold in the past decade and approximately two-thirds

of heart failure costs were related to hospitalization both chronic and critical care services (Lee, 2005; Stewart, 2005). Another burden for heart failure patients is frequent hospitalizations. Approximately 78% of heart failure patients have at least two admissions per year because of disease exacerbation (Stromberg et al., 2004). Moreover, in Thailand, the Medical Department of Bangkok and Metropolitan Administration (2005) revealed that approximately 40% of patients living with heart failure had to be readmitted more than once per year and 18% came back within one month of discharge. Furthermore, the heart failure length-of-stay in Thailand averages 9.6 days (Ministry of Public Health, 2005). The longer the length of stay, the more health budgets is used. High costs and frequent hospitalization indicated that heart failure is a very important concern for health care professionals and society in general.

The personal impact of HF is harder to quantify, but its burdens on patients are readily observable. In terms of physical symptoms, because of cardiac functional decline, patients have many challenging experiences from the symptoms of heart failure. The physical symptoms most commonly associated with heart failure include fatigue, dyspnea, paroxysmal nocturnal dyspnea, orthopnea, peripheral edema, chest pain, cough, and arrhythmias (Friedman, 1997; Nordgren & Sorensen, 2003; Zambroski, Moser, Bhat, & Ziegler, 2005). These symptoms make physical functioning worsen. Furthermore, heart failure affects psychological functioning. Patients cannot do their daily living activity by themselves so they feel less self-esteem than usual (Martensson, Karlsson, & Fridlund, 1998). In addition, the frequent hospital admissions can make HF patients feel anxious, depressed, stressful, insecure, and uncertain (Heo, Lennie, Okoli, & Moser, 2009). Consequently, their psychological functioning is worse.

Typically, a downward spiral occurs in heart failure. HF patients are initially functional, but when their symptoms worsen they are hospitalized and then discharged, usually not in as good a condition as when first stricken, only to repeat this cycle (Peacock, 2006). Therefore, role functioning is decreased, which leads to a worse quality of life when compared to people without heart failure (Hobbs et al., 2002; Johansson, Agnebrink, Dahlstrom, & Brostrom, 2004; Monsin Yamsakun, 1999). Heart failure patients must modify their health behaviors by following a medical regimen in order to lengthen life, reduce hospitalizations, and improve their quality of life (Adams et al., 1999).

7. Management of heart failure

Heart failure management can be both pharmacological and non-pharmacological, as described below. In general, heart failure management will be more successful if the patients accept and follow medical regimens, whether pharmacological or non-pharmacological. They often have a significant impact on the patient's functional capacity, quality of life, and mortality.

7.1 Pharmacological management

The most common approach in the treatment of heart failure is the use of pharmocological agents. In addition to the common triad of digitalis, diuretics, and Angiotensin Converting Enzyme Inhibitors (ACEIs), pharmacological management of heart failure now includes angiotensin II receptors antagonists, a combination of hydralazine and nitrates, and beta-adrenergic blockers (DeWald, Gaulden, Beyler, Whellan, & Bowers, 2000; Gheorghiade et al., 2000; Nohria, Lewis, & Stevenson, 2002). ACEIs cause arterial and venous dilatation, reducing both preload and afterload. Angiotensin II is elevated in patients with heart failure due to poor left ventricular

performance and hypo-perfusion of the kidneys. ACEIs also inhibit the stimulation of the adrenal cortex to release aldosterone. A decreased amount of aldosterone causes sodium excretion and consequently fluid retention is reduced (Johnson, Parker, & Patterson, 2002). In addition, ACEIs show a significant reduction in left ventricular filling pressure, systemic vascular resistance, mean arterial pressure, and heart rate (Garg & Yusuf, 1995). The side effects of ACEIs include orthostatic hypotension, reduced renal function, hyperkalemia, and cough. Thus, patients receiving this medicine should be continuously monitored for potassium level and renal function (Hoyle & Kahl, 2006).

Diuretic therapy is recommended for all patients with clinical evidence of fluid retention due to excessive sodium and water retention that occurs in HF's compensatory mechanism. Diuretic therapy is primarily utilized to decrease edema and pulmonary congestion by reduction of preload. The most-commonly prescribed agents include thiazide diuretics, loop diuretics, and aldosterone blocking agents, all of which can be used intermittently on a long-term basis and in combination with each other (Hoyle & Kahl, 2006). Dosage adjustments for diuretic therapy are obtained based on symptomatic improvement and daily body weights of the patient (Follath, 1998; Kramer, Schweda, & Riegger, 1999). Diuretics should be combined with ACEI, a beta-blocker, and usually digoxin (Hunt et al., 2001). Although diuretic therapy helps to relieve symptoms of volume overload, it may lead to increased activation of the rennin-angiotensin-aldosterone and sympathetic nervous systems. Paradoxically, it may also promote adverse neurohormonal activation, lead to metabolic abnormalities involving potassium and uric acid, and impair carbohydrate metabolism (Hoyle & Kahl, 2006).

Beta-blockers are included as standard therapy for management of chronic heart failure but can exacerbate or worsen HF in some patients. Beta-blockers have the ability to interrupt the normal progression of heart failure by disrupting compensatory neurohormonal activation and inhibiting effects of the sympathetic nervous system (Hoyle & Kahl, 2006). Patients need to be informed that benefits of beta-blockers may not be overtly seen in the person's symptomatology, but they may have positive effects on disease progression and survival (Johnson et al., 2002). However, beta-blockers have multiple potential side effects including bradycardia, hypotension, fatigue, and depression (Hoyle & Kahl, 2006). Patients who receive this kind of medicine should be closely monitored for these side effects.

Digitalis increases the force or strength of the heart's contraction. It also has benefits in the heart related to its neurohormonal modulating effects through the drug's increased delivery of sodium to the distal tubules, causing alteration of renin secretion from the kidneys, therefore promoting urine output (Porth, 2005). However, digitalis is contraindicated in patients with significant sinus or atrioventricular block (Hunt et al., 2001). Side effects of digitalis include arrhythmias, loss of appetite, nausea and vomiting, and gynecomastia (Hoyle & Kahl, 2006).

7.2 Non-pharmacological management

Non-pharmacologic treatments of heart failure, including exercise training, cardiac resynchronization therapy, and enhanced external counterpulsation, can decrease readmission rate and mortality (Beller, 2001). Non-pharmacological management strategies represent an important contribution to heart failure therapy. According to the guidelines of the Heart Failure Society of America (2006), non-pharmacological management focuses on general advice and measures such as

dietary changes (sodium restriction), regular physical activity, weight monitoring, smoking cessation, and alcohol cessation.

Sodium restriction is a significant approach in the management of all heart failure patients. Dietary indiscretion regarding salt can lead to cardiac decompensation, a common and preventable cause of hospitalization in patients living with heart failure (Hoyle & Kahl, 2006). The retention of salt and water due to the kidney's response to decreased cardiac output is manifested in heart failure patients' retention of fluid necessary to increase blood volume (Hunt et al., 2001). The excretion of excess fluid in heart failure patients can be achieved through the restriction of salt in combination with diuretic therapy (Porth, 2005). In the general population, the American Heart Association recommends that dietary NaCl be restricted to no more than 6.0 g/day (Kotchen & Kotchen, 2006). For heart failure patients, in general, a 2-gram sodium diet is frequently recommended (Grady et al., 2000). Several practices have suggested limiting sodium to a maximum of 3 grams per day for mild to moderate heart failure, while patients with severe heart failure should be limited to less than 2 grams of sodium per day. However, a 3-gram-per-day restriction may be a more realistic goal for patients with mild to moderate heart failure (Grady et al., 2000; House-Fancher & Foell, 2004).

Sodium and heart failure

1. Sodium

Sodium, one of the major minerals for humans, is found in all body fluids and tissues. Human body contains 52-60 mEq of sodium per kilogram in male and 48-55 mEq/kg in female, most of them (40.2%) are in the extracellular fluid (Dudek, 2006 (Berdanier & Zempleni, 2009; Schlenker, 2009). Most sodium absorption occurs in the small intestine (Julkrungka, 2002). Glucose and anions such as citrate, propionates, and bicarbonate enhance the uptake of sodium. Plasma sodium is tightly regulated through a hormone system, which also regulates water balance, pH, and osmotic pressure (Gibney, Lanham-New, Cassidy, & Vorster, 2009).

There are three excretory routes for sodium. Nighty percent of the sodium excretion is via the urine, under the control of aldosterone (Schlenker, 2009; Julkrungka, 2002; Schlenker, 2007). Sweat loss of sodium ions tends to be very low except with severe exertion in hot climates. Fecal losses are also low in healthy individuals, usually no more than 2% remains to be excreted in the feces (Gibney et al., 2009; Schlenker, 2007).

Sodium has many functions to the human body such as water balance, acid-base balance, cell permeability, and muscle action. Differences in the sodium concentrations of body fluids largely determine the distribution of water via osmosis from one area to another (Schlenker, 2007). The sodium pump located in all cell membranes controls the passage of materials in and out of the cell. In addition, sodium ions help to transmit electrochemical impulses along nerve and muscle membranes and maintain normal muscle action. It can be seen that sodium is involved in nerve conduction, active cellular transport and the formation of

mineral apatite of bone. The plasma membrane enzyme sodium-potassium-ATPase plays an essential role in sodium functions about water balance, nerve conduction, and active transport (Gibney et al., 2009). Sodium plays a key role in maintaining fluid balance and cell function in the body (Lennie, 2008). It is needed for maintaining extracellular fluid, acid-base balance and oncotic pressure, as well as muscle and nerve activity (Mohan & Campbell, 2009).

2. Effect of sodium on heart failure

Sodium is widely associated with blood pressure (Bowers, 2007). The primary adverse effect related to increased sodium chloride intake is elevated blood pressure (Otten, Hellwig, & Meyers, 2006). This effect directly related to some kinds of chronic disease, especially cardiac disease. Evidence for an association between sodium intake and blood pressure is provided by both observational and intervention studies (Kotchen & Kotchen, 2006).

Sodium is important for human health, but the human body needs it in amounts that are neither too great nor too small. Lack of sodium can result in excessive water intake, anorexia nervosa, ulcerative colitis, liver disease, congestive heart failure with edema, and severe infection and diarrhea (Gibney et al., 2009). On the other hand, excessive sodium intake may have roles in degenerative illnesses such as hypertension, coronary heart disease, stroke, gastric cancer, osteoporosis, and bronchial hyperactivity. Although some epidemiological studies have indicated that sodium intake has an adverse effect on blood pressure, the mechanism linkage is unclear but probably relates to sodium homeostasis (Gibney et al., 2009). Extracellular sodium concentrations may adversely affect vascular reactivity and growth and stimulate myocardial fibrosis (Gibney et al., 2009).

A high salt intake increases blood pressure and the risk of left ventricular hypertrophy (LVH) and left ventricular (LV) dysfunction. This means the risk of heart failure is increased (He, Burnier, & Macgregor, 2011). Furthermore, in heart failure patients, there is already retention of salt and water. A high salt intake aggravates this, thereby exacerbating heart failure symptoms and progression of the disease. Even in well-compensated heart failure, a sudden increase in salt intake causes a rapid increase in extracellular volume and may precipitate left ventricular failure (He et al., 2011). The most common reason for heart failure hospitalizations is volume overload and the primary cause of volume overload is excessive dietary sodium intake (Bennett et al., 1998; Michalsen, 1998; Tsuyuki et al., 2001).

3. Sources of sodium

The term salt and sodium are often used synonymously, although, on a weight basis, salt or Sodium chloride (NaCl) comprises 40% sodium and 60% chloride; 1 gram of sodium is equivalent to 2.55 gram of salt (Mohan & Campbell, 2009; Dudek, 2006). One teaspoon of salt has 2,300 mg (2.3 g) sodium (Gropper, Smith, & Groff, 2006). Salt is the major source of sodium in foods (Gibney et al., 2009; Mohan & Campbell, 2009). In the typical American diet, approximately 75% of the sodium consumed comes from salt or sodium preservatives added to foods by food processing or manufacturers. Only 10% of the consumption comes from foods in their natural form such as milk, meat, eggs, and most vegetables and another 15% sodium consumed is salt added during cooking or at the table (Dudek, 2006; Gropper et al., 2006). An average diet prepared in the kitchen with some commercially prepared foods, foods salted during cooking, and some salt added at the table provides 3 to 7 grams of sodium daily (Peckenpaugh, 2010). Sodium chloride

accounts for about 90% of total sodium intake in the United States (Otten et al., 2006).

4. Sodium Intake

Most adults consume more sodium than the current UL. The median sodium intake is different between gender. Women consume less sodium than men. In addition, people at younger ages consume more sodium than when they are older (Schlenker, 2007). For the region, in the United States, sodium intakes are highest in the southern region and lowest in the western region (Hajjar & Kotchen, 2003).

Adherence to low sodium diet

1. Definition of adherence to low sodium diet

The phenomenon of how patients follow treatment was at first known as compliance. Hussey and Gilliland (1989) defined compliance as "the positive behavior that patients exhibit when moving toward mutually defined therapeutic goals." The attributes of compliance are ability to follow a prescribed plan, yielding to the request of others, obedience, adaptability, and flexibility (Ingram, 2009). It can be seen that the term compliance reflects its view of patients as passive, powerless recipients of care (Cohen, 2009).

Later, the alternative term adherence was proposed to replace the term compliance (Stromberg et al., 2004). The World Health Organization (2003) has revised and merged old meanings to define adherence as "the extent to which a person's behavior–taking medication, following a diet, and/or executing lifestyle changes–corresponds with agreed recommendations from a health care provider." An alternative definition of adherence is "persistence in the practice and maintenance of desired health behaviors and…the result of active participation and

agreement" (Cohen, 2009). These definitions seem to focus on patients' behavior. The term adherence reduces the attribution of greater power to the doctor in the doctor-patient relationship which the term compliance suggests (Vermeire, Hearnshaw, Van Royen, & Denekens, 2001). Patients are considered adherent when they do what the healthcare provider recommends (DiMatteo, 2004). The attributes of adherence include alignment of patient behavior and health recommendations, mastery of a new behavior and health knowledge, and perceived ability to meet the outcome targets and overcome perceived barriers (Cohen, 2009).

Although the main difference between "compliance" and "adherence" is that adherence requires the patients' agreement to the recommendation, these two terms are used interchangeably in healthcare literature (Shay & 2008; Stromberg et al., 2004; van der Wal & Jaarsma, 2008). However, it is preferable to use the term adherence to incorporate the broader notions of concordance, cooperation, and partnership (Vermeire et al., 2001). Thus, in this study the term adherence is used instead of compliance.

In heart failure patients who have been given a low-sodium diet as part of their treatment, adherence can be defined in several ways. It can refer to *the extent* to which a person's behavior in following a prescribed low sodium diet corresponds with agreed recommendations from a health care provider. In addition, adherence to low sodium diet can be defined as *the ability* to follow a healthcare professional's recommendations of a low sodium diet regimen (Evangelista & Shinnick, 2008). Additionally, adherence to low sodium diet can also be viewed in terms of *the results or outcome* of following a low sodium diet restriction, which can appear in urine sodium level.

To sum up, in this study, adherence to low sodium diet is considered as behavior. Adherence to low sodium diet refers to how well, or to what extent the heart failure patient's behavior conforms to the prescribed low sodium diet regimen.

Measurement of adherence to low sodium diet

Despite the importance of adherence to low sodium diet, agreement on the best measurement of adherence has not been reached. A number of objective and subjective methods have been used to measure adherence to low sodium diet. As mentioned above, for purposes of this study, adherence to low sodium diet is considered as behavior. Therefore, dietary sodium intake can be a measure of adherence to low sodium diet in heart failure patients.

3.2.1Objective methods

Objective methods can be considered as direct measurements. They usually involve the detection of a chemical (metabolite or marker) in a body fluid such as blood and urine (Vermeire et al., 2001). These kinds of methods to assess adherence to low sodium diet are considered objective, reliable, and easily quantifiable.

24-hr urine sodium excretion is the most common method used to reflect adherence to low sodium diet in heart failure patients. Typically, 24-hr urine sodium excretion, a biomarker measuring sodium, can account for 95-98% of dietary sodium intake. This method increases accuracy of adherence assessments (Yancy & Boan, 2006). However, the within-person variability in sodium excretion may be as high as 30% (Bentley, 2006). Moreover, it has major disadvantages including relatively high costs and resource limitations in medical settings (Kyngas, Duffy, & Kroll, 2000).

Furthermore, validity may be difficult to reach because of multiple stages of biochemical measurements. A bias can enter the process at any point of time depending on the quality control of the laboratory. Moreover, partially collected urine specimens, heavy perspiration, secretion into breast milk, and chronic diarrhea may interfere with the agreement between 24-hr urine excretion and dietary sodium intake.

Another objective method is behavioral observation. The advantage of this method is that it can be applied to treatment. However, this method greatly depends on who the observer is and whether the observer has been adequately prepared for the observation (Kyngas et al., 2000).

3.2.2 Subjective methods

In terms of subjective methods (indirect measurements), the easiest way to assess adherence to low sodium diet is to ask the patient (Cramer & Spilker, 1991). Self-report measures are the most commonly used to assess adherence to low sodium diet. Easy applicability and low costs are the major reasons why this method is popular. These indirect measures include self-report adherence questionnaires, food records, and food recall questionnaires. However, interviews and all self-report methods are vulnerable to overestimates of adherence and underestimates of nonadherence (Vermeire et al., 2001).

Food records have been the “gold standard” for assessing adherence to diet recommendations. Basically, the heart failure patient records all food and liquid consumed over a specified time period, usually 3 to 7 days (Yancy & Boan, 2006). The patients will be taught to describe and give an estimate of the portion size or weight of the food eaten (Bentley, 2006). The information can be obtained

either by weighing the food or describing portions of food in terms of household measures, pictures, food models, or package sizes. The more information the patient provides, the more accurate will be the assessment of what nutrients were consumed (Yancy & Boan, 2006). However, it may be difficult at times to obtain self-report measures, especially when the patients and their family refuse to comply with the assessment method.

24-hour diet recall is a method of diet assessment that is less burdensome to the heart failure patients. With this method, heart failure patients recall all food and drink consumed over the previous 24 hours. The accuracy of this method can be improved by using a multiple-pass method, which uses five successive approaches to questioning the patient about what was eaten (Yancy & Boan, 2006). Pictures of foods of different portion sizes can improve accuracy. However, they can also increase the complexity and duration of the assessment. The 24-hr diet recall may not accurately reflect food consumption on a day-to-day basis. Generally, this method is appropriate when evaluating diet adherence in a large sample size (Vitolins, Rand, Rapp, Ribisl, & Sevick, 2000).

To sum up, several methods are used to assess adherence to low sodium diet in heart failure patients–both direct and indirect measurements. As mentioned above, each method has advantages and disadvantages. Although 24-hr urine sodium excretion is the most common direct method, it needs strong co-operation from patients. In addition, 24-hr urine sodium excretion cannot directly reflect patients' behaviors. Likewise, 24-hour diet recall and food frequency questionnaire may be affected by the memory of heart failure patients. Which method should be used depends on what the research needs. In this study, adherence to low sodium diet is

considered as the patients' behavior. Therefore, using a 3-day food record on adherence to the low-sodium diet is appropriate for this study.

Adherence to low sodium diet in heart failure patients

Due to the severity of symptoms, heart failure patients have to change their health behavior to maintain their life and improve quality of life. Heart failure patients must modify several health behaviors, including physical activity, dietary sodium restriction, medication adherence, and smoking and alcohol avoidance. Moreover, most heart failure patients complained that compliance with diet seemed to be the most difficult behavior to change (Evangelista et al., 2003).

Adherence to low-sodium diet in heart failure patients is poor. Adherence rates have been reported to be between 22% and 70% (Bennett et al., 1998; Evangelista et al., 2001; Happ et al., 1997; Kravitz et al., 1993). Only about 40% of the patients had a daily sodium intake that was less than 3 grams (Lennie et al., 2008). In two studies, nonadherence rates ranged from 35% to 71% (Evangelista et al., 2003; Evangelista et al., 2001).

In addition, some heart failure patients may adhere to low sodium diet only during the first stage after discharge. Similarly, some heart failure patients intermittently adhere to low sodium diet. Lennie et al.(2008) studied the relationship of heart failure patients' knowledge, perceived barriers, and attitudes regarding low sodium diet recommendations to adherence in 246 American heart failure patients. The findings showed that 18% of these patients *always* followed their low-sodium diet, 57% of the patients *usually* followed the prescribed diet, 21% of the patients followed the diet *sometimes* and 4% of the patients *never* followed the low-sodium

diet. Additionally, a total of 54% of patients stated that it was hard or very hard to follow the low-sodium diet.

Adhering to a sodium-restricted diet is a complex and challenging behavior that requires heart failure patients to understand the sodium content in foods, to purchase and prepare food properly, and to follow these restrictions on a daily basis for the remainder of their lives (Bennett, Hackward, & Blackburn, 2001). Patients have reported non-adherence to dietary sodium restrictions because of poor taste, lack of availability of foods that are low in sodium, difficulty eating at restaurants and at social activities, preparation time, and cost (Bennett et al., 1997).

Cultural differences between western and Asian countries

According to a review of the literature, in Western countries, many studies were conducted examining factors influencing adherence to low sodium diet in heart failure patients. However, in Thailand, no study has directly focused on adherence to low sodium diet in heart failure patients. Therefore, it should be recognized that what is known about adherence to low sodium diet in heart failure patients is based on inquiries within the Western culture. Cultural differences can lead to different health behaviors of the patients. As a result, factors influencing adherence to low sodium diet which have been explored based on data from Western populations may not be appropriate for Eastern populations such as in Thailand.

There are several meanings of culture. Culture may refer to the way of life in the social environment, including the methods of living, eating, dressing and searching for happiness, and the rules of living (Spancer, 1979). Another definition is the systems of ideas, values, beliefs, knowledge, and customs which are transferred from one generation to another in society. It can be seen that culture affects

patterns of living at both individual and group levels (Runglertkrengkrai & Engkaninan, 1987).

1. Self-representation

Culture influences self-representation of the person. The individualized self of Westerners (hereafter called Americans) which is characterized by inner representational organizations emphasize an individualistic "I-ness" with sharp differentiation between inner images of self and others, and considerable social individuation. On the other hand, Asians have created a sense of self that is much more inclusive of "we-ness", and have a closer interconnection of inner images between self and others. In Eastern cultures, higher levels of empathy and receptivity to others and considerable sensitivity to nonverbal communication are also cultivated (Nilchaikovit et al., 1993). However, to maintain privacy, Asian persons will not reveal all kinds of personal feelings in the usual relationship without a high degree of trust that the confidant will be receptive and empathic, and without the assurance that confidentiality will be well kept. As a result, typical Americans are more self-confident and encouraged to do something that deviates from group consensus, whereas Asians have a greater awareness of social context and, before making any decision, are more concerned about the ideas of other persons such as friends, family, and co-workers. Consultation with family members is important in making decisions (Davidson et al., 2007). Therefore, while Americans may be confident and have the courage to change their health behaviors due to the recommendation treatments, Asians may need more motivation or support from family and relatives in order to modify behaviors.

2. Attitude and belief about health and illness

Furthermore, Americans and Asians have different beliefs and attitudes about health and illness. For many Americans, death and illness is viewed as disruptions that are inflicted upon them. Death and illness take control away and are in some cases experienced as personal failures (Toynbee, 1969 cited in Nilchaikovit, Hill, & Holland, 1993). For coping with death, people have to try to take control and beat it. Nevertheless, Asians, particularly Thais, believe that illness and death are part of the normal cycle of life, according to Buddhism. The cause of illness and death is an action or bad luck from the previous life. If a person did a bad thing in the previous life, they get a bad thing in the present life. Asians may believe that one can do nothing to change its course, whether it is a matter of luck or the result of one's own deed in the past. It seems death and illness are accepted, though not favored, and there is little sense of personal failure. Thus, Thais can face death and illness with calm and peace. However, most Thais will achieve this ideal when they experience helplessness and have no control over death and illness. Consequently, if they cannot engage the target behaviors according to the treatment recommendation, Thai patients may experience some negative emotions such as anger, depression less than American patients. On one hand, American patients may not give up the fight with illness and death as readily as Thais.

3. Role of family

In addition, American families and Asian families are different in some aspects, such as the role of family in the illness situation. Asians view problems such as patient's illness as the family's problem rather than just an individual's problem. For this reason, Asian families may seem to be overinvolved or try to take over responsibilities and make decisions for the patient (Nilchaikovit et al., 1993).

However, family can help to motivate and support patients for changing or maintain the target behaviors to reach the therapeutic goal. Family involvement has been found to enhance patient compliance. Healthcare providers can successfully motivate the patient to renew coping efforts in order to fulfill his or her role obligations in the family, such as parenthood, or being a good daughter or son, whereas queries made to the individual's personal goals may go unanswered (Muecke, 1983). Furthermore, in Asian cultures when a person is sick, family members will take turns as caretaker and stay with the patient around the clock, if possible. It is also not uncommon that the family will try to take care of the patient in a way that may seem "infantilizing" from an American viewpoint, such as spoon feeding the sick person (Nilchaikovit et al., 1993). This is rarely found in the American context, where an ideal of independence is highly cherished.

4. Taste and resource of food

Another difference between American culture and Asian culture is about food and particular kinds of taste. The Thai National Statistical Office (2005) found that approximately 12% of Thai adult usually love to eat salty foods. In addition, many traditional Thai dishes consist of vegetables. Thais mostly buy foods at the open-air market where most of the food packages have no nutrition label. This is different from Americans. Many kinds of food have a salty taste. Besides, generally, grocery stores are the main source of food in U.S., so American people can look at the nutrition of the food that they want by examining the nutrition label due to the nutrition label on the package. This can lead to different behaviors in each society. For example, it is hard to select the appropriate food for Thai heart failure patients who mostly buy foods from open-air market, compare with those Americans.

Conclusion

These basic differences between Asians and Americans can affect the ways patients behave. Asian patients might look different from American patients because they may need more motivation and support to change behavior. In Asia, family might take a bigger role in management, allowing patients to be more dependent. Factors influencing adherence to low sodium diet in American heart failure patients may be not the same in Thai contexts. Therefore, factors influencing adherence to low sodium diet in Thai heart failure patients should be explored. The finding can be used for understanding patients' behaviors.

Theoretical framework: The Theory of Planned Behavior

This study will use TPB as its theoretical framework. TPB is an extension of the earlier Theory of Reasoned Action (TRA) (Conner, 2005). Both TRA and TPB have been developed by Icek Ajzen and Martin Fishbein since 1975 (Boyle, 2006). The theories focus on theoretical constructs concerned with individual motivational factors as determinants of the likelihood of performing a specific behavior (Montano, 2008). Compared to TRA, TPB includes an additional construct, which is perceived behavioral control over performance of the behavior.

According to the TPB, behavior is determined directly by a person's intention to perform the behavior (Boyle, 2006). Persons tend to engage in behavior they intend to perform (Conner, 2005). The TPB has been useful in explaining behavior change (Bentley, Lennie, Biddle, Chung, & Moser, 2009). It is a conceptual framework used to explain a wide range of health behaviors, both in healthy people and in chronic illness patients, such as breast cancer, coronary artery disease, heart failure, HIV/AIDS, renal diseases, and hypertension.

The TPB focuses on four major constructs: attitude, subjective norms, perceived behavioral control, and behavioral intention. It is presented as a chart in Figure 2. The most important determinant of behavior is behavioral intention. Direct determinants of individuals' behavioral intention are their attitude toward performing the behavior and their subjective norms associated with the behavior. In addition, TPB adds perceived control over the behavior, taking into account situations where one may not have complete volitional control over a behavior.

The first primary component of the TPB is attitude. Attitude is determined by the individual's beliefs about outcomes or attributes of performing the behavior, weighted by evaluations of those outcomes (Montano, 2008). According to one study, the person who holds strong positive beliefs about the outcome of the specific behavior will have a positive attitude toward the behavior (Hayden, 2009). In TPB, attitude is proposed as directly determinant to behavioral intention. In addition, attitude has an indirect effect on behavior through intention. Prior studies revealed that attitude correlated most frequently with adherence to low sodium diet in heart failure patients. Therefore, attitude will be studied in this study.

A person's subjective norms are determined by that person's normative beliefs, which are founded on whether important referent individuals approve or disapprove of performing the behavior, weighted by the person's motivation to comply with those referents (Montano, 2008). A person who believes the referents think she should engage in the behavior will hold positive subjective norms. Subjective norms can be considered as the perceived social pressure to engage or not to engage in the behavior (Hayden, 2009). They directly affect intention and indirectly affect behavior through intention. The prior studies showed that subjective

norms affected adherence to low sodium diet in heart failure patients. Thus, subjective norms will be tested in this study.

Perceived behavioral control (PBC) is one of the TPB constructs. Perceived behavioral control is an individual's perceptions about the degree to which she or he has control over the behavior, can overcome barriers, or can perform the behavior (Contento & 2007). On one hand, this construct focuses on how easy or difficult it is to perform the behavior (Ajzen, 1991). The construct of perceived behavioral control is similar to the construct of self-efficacy in Social Cognitive Theory and Self-Efficacy Theory (Ajzen, 2002). According to TPB, perceived behavioral control directly influences behavioral intention. Furthermore, perceived behavioral control has an indirect effect on behavior through intention. Previous studies explored how perceived behavioral control related to adherence to low sodium diet in heart failure patients. Hence, perceived behavioral control will be included in the hypothesis testing in this study.

According to the theory, behavioral intention is the extent to which someone is ready to engage in a certain behavior, or the likelihood that someone will engage in a particular behavior (Ajzen & Fishbein, 1980; Boyle, 2006). This construct seems to be similar to commitment to a plan of action in a health promoting model in terms of the concept of "intentionality." Additionally, intention is an important factor influencing behavior. Other factors indirectly affect behavior through intention. According to the literature review, no studies have been conducted about the relationship between intention and adherence to low sodium diet in heart failure. Therefore, intention will be included for testing in this study.

Behavior is the end point in the TPB model. Based on this theory, any behavior consists of a) the action performed, b) the target at which the action is directed, c) the context in which it is performed, and d) the time at which it is performed (Ajzen, 1988; Conner, 2005; Fishbein & Ajzen, 2010). How to parse the behavior into action, target, context, and time elements is up to investigators to define the behavioral criterion as it best fits their research purposes (Fishbein & Ajzen, 2010). In this study adherence to low sodium diet will be focused on as health behavior.

As mentioned above, the relationships among constructs according to TPB are demonstrated as in Figure 2

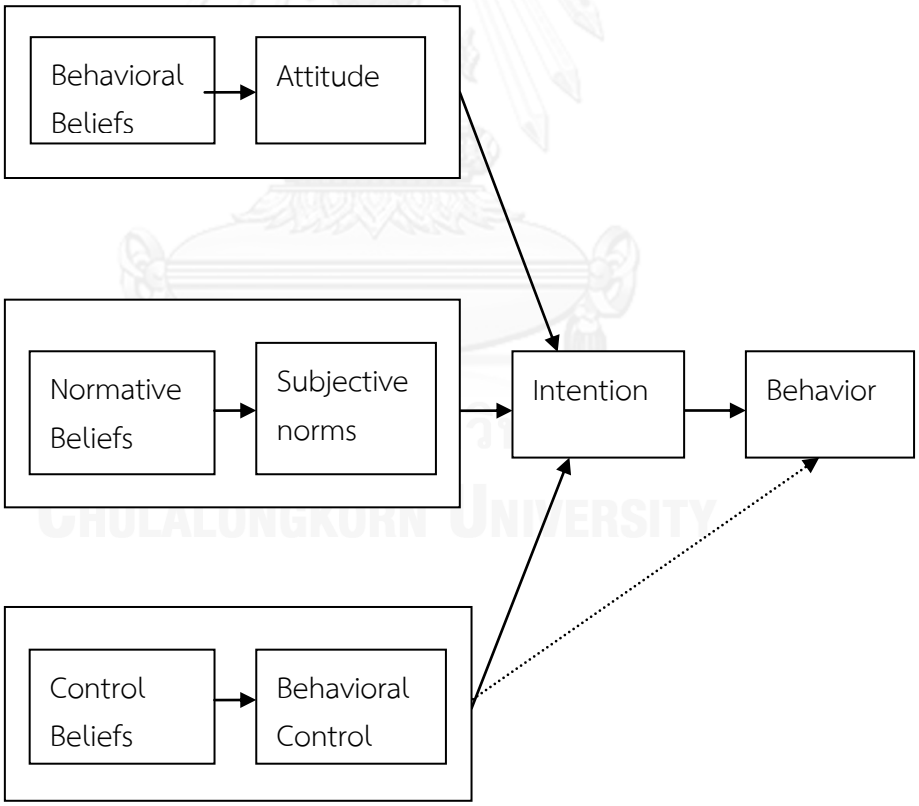

Figure 2 Theory of Planned Behavior (Ajzen, 2005)

Factors influencing adherence to low sodium diet in heart failure patients

Many factors related to adherence to low sodium diet in heart failure patients have been studied. These factors will be explained below.

1. Attitude

Attitude is one of the factors that influence behavior. According to the TPB, attitude refers to the patient's beliefs about outcomes of performing the behavior (Ajzen, 2005). Here, the term "attitude" focuses on beliefs about the target behavior, not attitude in general. Van der Wal et al. (2006) examined all dimensions of compliance and its related factors in 501 heart failure patients. The findings revealed that compliance was related to knowledge, depressive symptoms, and beliefs, which are, in turn, influenced by attitude.

The other study came from Van der Wal Martje et al. (2007). The aims of this study were to: (1) gain insight into patients' beliefs about compliance; (2) examine the association of demographic variables and depressive symptoms to beliefs; (3) assess compliance with medication, diet, and daily weighing; and (4) examine the association of compliance to patients' beliefs. Nine hundred fifty-four HF patients were the participants who completed questionnaires on beliefs about medication and diet. Most important barriers and benefits were assessed as well as differences in beliefs between subgroups and the association between compliance and beliefs. The findings showed that the most important barriers were diuresis during the night (57%), the taste of food (51%), and limited ability to go out (33%). A barrier related to failure to weigh daily was forgetfulness (26%). Patients with depressive symptoms and patients with a low level of HF knowledge experienced more barriers to compliance with the HF regimen.

2. Subjective norms

Subjective norms is a factor related to adherence to low sodium diet in heart failure patients. According to the TPB, subjective norms refers to a patient's belief about whether his or her important referents think the patient should perform the behavior. If the referents approve or support patient in doing the behavior, patient will be more likely to adhere to that behavior. The referents can be the patients' families, peers, friends, and even health care providers (Ajzen, 2005).

In one study, heart failure patients perceived adherence to low sodium diet as *frustrating* and *depending* on others (Granger et al., 2009). Heart failure patients may not prepare their diet by themselves. In addition, Sheahan & Fields (2008) found that "eating alone" was one of the barriers to adherence to SRDs in heart failure patients. Furthermore, for those participants who stated that they adhered to an SRD, concern for their family members was the strongest motivator and major theme.

Likewise, Heo, Lennie, Moser, & Okoli (2009) explored heart failure patients' perceptions of nutrition and dietary adherence, focusing on low sodium diet using a qualitative approach. The findings showed that factors identified as affecting adherence to low sodium diet included social pressure and encouragement from others, social situations, and food as a source of pleasure and enjoyment. One of the barriers to following a low sodium diet was lack of support from friends and family. Moreover, lack of social support is a risk factor for non-adherence in heart failure patients (Artinian et al., 2002). On the contrary, strong social support has been shown to contribute to increased low sodium adherence (Sabate, 2003).

Luyster, Hughes, and Gunstad (2009) examined the impact of psychosocial factors (depression, anxiety, and social support) on adherence to dietary recommendations in this growing subgroup of HF patients. Eighty-eight HF patients, with a mean age of 70 years, treated with an ICD (77% male) completed questionnaires assessing depression and anxiety symptoms, social support, and dietary adherence. The results showed that only 16% of patients reported following dietary recommendations all of the time. Greater depression and anxiety symptoms were associated with poorer dietary adherence, whereas social support did not predict reported dietary adherence.

3. Perceived behavioral control

Perceived behavioral control is one of the factors influencing adherence to low sodium diet in heart failure patients. Heart failure patients' perception of the degree to which they have control over the behavior, can overcome barriers, or can perform the behavior has been shown to affect adherence (Ajzen, 2005). Perceived behavioral control focuses on how easy or difficult to perform the behavior (Ajzen, 1991, 2005).

Evangelista et al. (2003) studied compliance behaviors of advanced heart failure patients. The findings revealed that of the 70 elderly patients, 37% had difficulty following their diet. Likewise, the findings showed inverse relationships between perceived difficulty following and compliance with all prescribed regimens: the more perceived difficulty, the less compliance. In this study, reasons for difficulty following diet included lack of motivation and lack of self-control.

4. Intention

Intention is defined as the extent to which someone is ready to engage in a certain behavior, or the likelihood that someone will engage in a particular behavior

(Ajzen, 2005; Ajzen & Fishbein, 1980; Boyle, 2006). Intention is similar to commitment to a plan of action in a health-promoting model, in terms of the concept of "intentionality." According to TPB, intention has a positive effect on target behavior. If the patients have more intention, they will be more likely to engage in performing a particular behavior (Ajzen, 2005; Montano, 2008). None of the studies in the literature review was conducted to describe behavioral intention to adhere to low sodium diet in heart failure patients.

Conceptual Framework

This study will test the relationships between variables and adherence to a low-sodium diet in Thai heart-failure patients. The variables are chosen from the Theory of Planned Behavior (TPB) and the literature review. They are attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and behavioral intention.

Attitude is determined by the individual's beliefs about outcomes of performing the behavior (behavioral beliefs), weighted by evaluations of those outcomes (Ajzen, 2005; Montano, 2008). Patients who hold strong beliefs that valuable outcomes will be caused by performing a behavior will have a positive attitude toward the behavior. As a result, those patients will have more intention and engage more to perform that behavior. Several studies showed that attitude influences adherence to low sodium diet in heart failure patients (Ajzen, 2005).

Subjective norms has a positive influence on adherence to low sodium diet in heart failure patients through intention. Patients who believe that their referents think they should perform the behavior and are motivated to meet expectations of those referents will hold a positive subjective norms. Thus, behavioral intention will

be increased and lead the patients to engage in performing the behavior (Ajzen, 2005; Montano, 2008). Several researchers have shown that family help or support is the major facilitator of adherence to low sodium diet in heart failure patients (Artinian et al., 2002; Granger et al., 2009; Sabate, 2003; Sheahan & Fields, 2008).

Perceived behavioral control is expected to have a direct effect on behavior (Ajzen, 2005; Montano, 2008). If patients perceive that they can do that behavior and it is not hard to do, they will perform that behavior. Studies show the influence of perceived behavioral control on intention and adherence to low sodium diet in heart failure (Jitsacorn, 2000; Haobin, 2000; Oka et al., 1996; Pothikanun, 2000). Intention positively affects adherence to low sodium diet. The more intention, the more performance of the activity (Ajzen, 2005; Montano, 2008). If the patients have more intention to adhere to low sodium diet, they will perform and maintain the adherence.

In conclusion, the conceptual framework that reflects relationships among these variables in this study is illustrated in Figure 3, and the substruction diagram of this study is shown in Figure 4

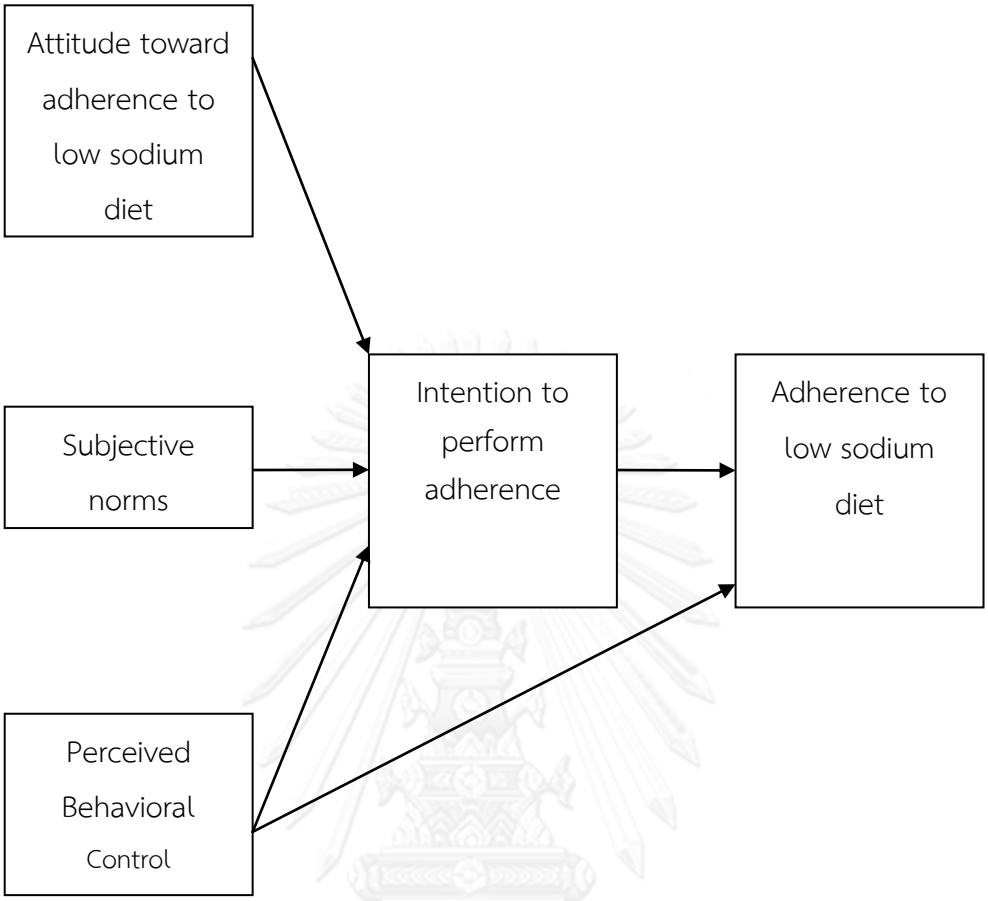

Figure 3 Conceptual Framework

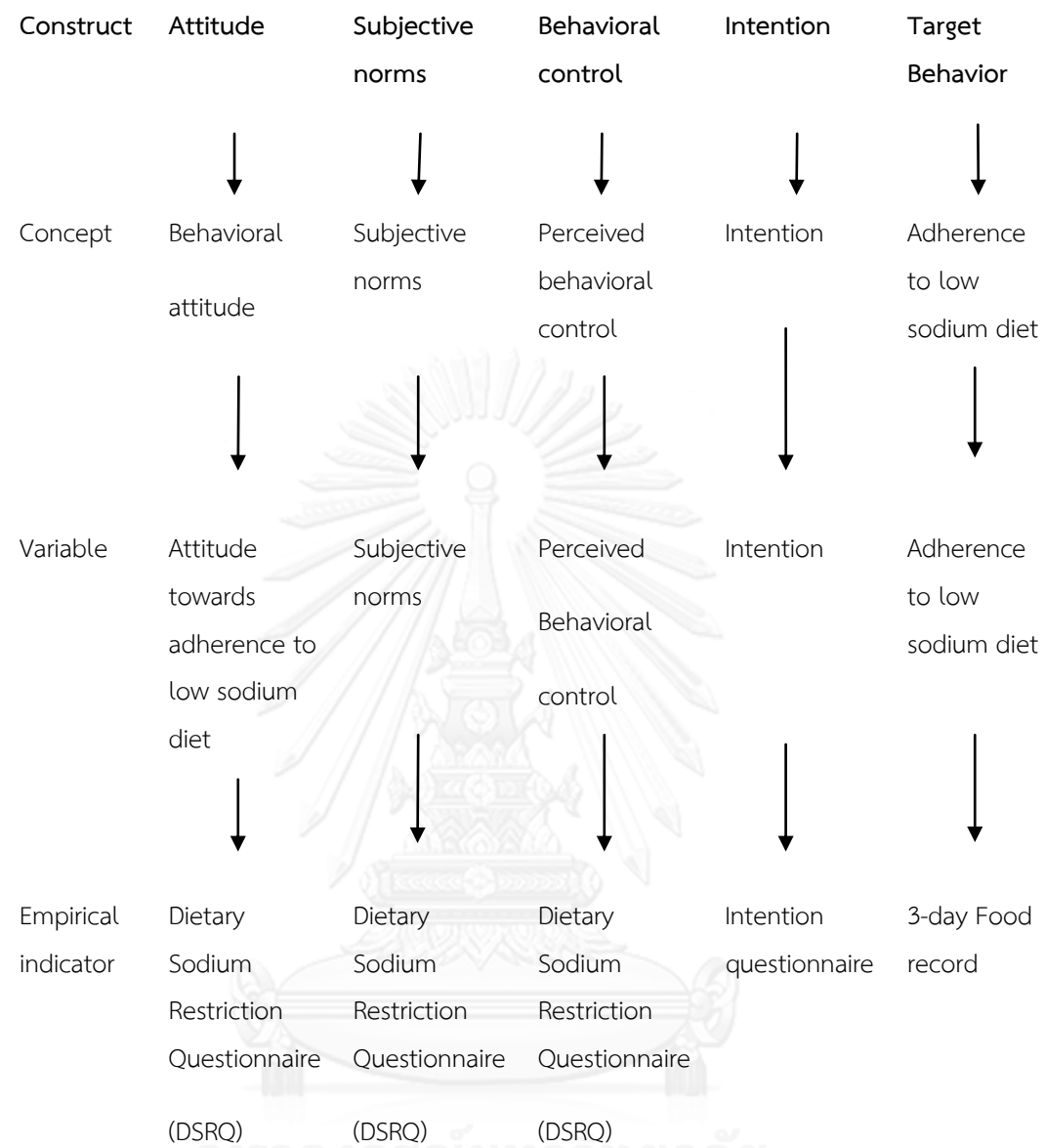

Figure 4 Substruction diagram of adherence to low sodium diet based on TPB

CHAPTER III
RESEARCH METHODOLOGY

This chapter describes the research design and methods used in this study. The contents of this chapter include research design, population, sampling technique and sample selection, measurements, protection of human subjects, data collection and data analysis procedure.

Research design

The purpose of this study were to develop a causal model to explain adherence to low sodium diet, and examine the causal relationships between variables including attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention on adherence to low sodium diet in Thai persons with heart failure.

It was important that the design was matched with the purpose, research question and hypothesis of the study. Thus, in order to achieve the study purpose, this study was a descriptive correlational research design. This design has many advantages. The design can be used for predicting one variable (DV) based upon other variables (IV) in a naturalistic situation without any manipulation. Moreover, this design is appropriate when budget or time is limited. Therefore, a descriptive correlational design was suitable for this study.

Population and sample

The population in this study was a group of persons with heart failure who attended outpatient departments, heart failure clinics, or cardiac clinics of the public hospitals in Thailand.

The sample in this study was a group of persons with heart failure who attended outpatient departments, heart failure clinics, or cardiac clinics of the public hospitals in Thailand, had no critical conditions or serious complications, and met inclusion criteria as follows:

Inclusion criteria

1. Diagnosed with all stages of heart failure alone or diagnosed with their baseline diseases and reported symptoms of heart failure in the medical record

2. Get the recommendation from healthcare providers to follow a low sodium diet.

3. Age between 18 years old and over

4. No cognitive impairment

5. Able to communicate in Thai

6. Willing to participate in this study

Exclusion criteria

Patients were not included if met the exclusion criteria as follows:

1. Have critical conditions or serious complications such as orthopnea, abnormal (cyclic) breathing (Cheyne-Stokes respiration), pulmonary edema, cerebral hypoxia.

2. Have psychiatric problem or psychiatric diagnosis

Sample size

Hair et al (2006) suggest the most common is Maximum Likelihood Estimation (MLE) to estimate procedure and provide valid results of sample size. The recommendation is a sound basic for estimate sample size is 200. The minimum ratio of observations to variables is 5:1; however, the preferred ratio is 15:1 or 20:1. In this

current study the hypothesized model contained 29 parameters so the minimum requirement should be 145 – 580 cases. In addition, the literature showed that the postal questionnaire response rates were 58–71% in cardiac patients (Byrne, Walsh, & Murphy, 2005; Campbell et al., 1998; Lormaneenopparat & Kantaratanakul, 2009). Forty two percent of the total sample size was added to take into account drop-outs due to the response rate. Thus, the minimum sample size in this current study should be 206 cases. Data from a total of 235 cases from the Central region of Thailand were collected and 172 patients returned the food record, giving a response rate of 73.19%. In these 172 patients, only 165 cases completed enough data in food record. Therefore, 7 cases were missing data.

Setting

Because heart failure needs complex technological support both for diagnosis and treatment, the settings for data collection should be the regional hospitals (tertiary care) in central region of Thailand. The data collection took place at the outpatient department and/or cardiac clinic of the public tertiary care hospitals.

Sampling method

1. Setting sampling

Thailand has been divided into six regions according to the geographical area. Central region including Bangkok consists of 22 provinces. Each province has similar population characteristics. Additionally, each province does not have the regional hospital. Only 9 of 22 provinces have at least 1 regional hospital in each. There were only 17 regional hospitals in central region including Bangkok and 6 regional hospitals were randomly selected, as shown in Table 3. As a result, the settings for the current study were Phra Na Knon Sri Ayutthaya Hospital, Rachaburi Hospital, King

Chulalongkorn Memorial Hospital, Thammasat University Hospital, Central Chest Institute of Thailand, and Rajavithi Hospital.

Table 3 Number of regional hospitals in central region of Thailand

province	Number of total regional hospitals	Number of selected hospital	Number of heart disease cases per year		
			2009	2010	2011
Bangkok	8	2	30,252	35,008	35,108
Nonthaburi	1	1	5,939	7,116	7,319
Nakorn Patom	1	-	4,440	4,536	4,599
Ayudhaya	1	1	4,175	4,693	4,383
Supanburi	1	-	4,030	4,366	3,955
Nakorn Sawan	1	-	3,649	4,249	3,743
Rachaburi	1	1	3,616	4,378	3,485
Saraburi	1	-	3,173	3,434	2,435
Pathumthani	2	1	3,092	3,270	1,398
Total	17	6			

2. Participants sampling

A simple random sampling was used to yield a probability sample of persons with heart failure as the process following.

1. On the day before data collection day, at cardiac clinic/heart failure clinic, the researcher reviewed medical record of the patients who have the appointment with the physician on next day, and selected the patients who met the inclusion criteria. Then participants sampling was done using simple random sampling method.

2. On the data collection day, if the sampling eligible participants did not come to the appointment or refused to participate in the study, simple random sampling was done again to recruit the other eligible participants instead.

Research instruments

Structured questionnaires were employed for data collecting including a demographic questionnaire, The Dietary Sodium Restriction Questionnaire (DSRQ), Intention to adherence to a low sodium diet questionnaire, and a 3-day food record. The study variables and its indicators or instruments are presented in Table 4

Table 4 Variables and their methods of measurement in the study

Variable name	Method of measurement
Adherence to low sodium diet	A 3-day food record
Behavioral intention	Self-report behavioral intention questionnaire
Attitudes	DSRQ: attitudes subscale
Subjective norms	DSRQ: subjective norms subscale
Perceived behavioral control	DSRQ: perceived behavioral control subscale
Demographic factors	Self-report questionnaire/medical record review

Translation process for translated instruments

An instruments needed to be translated was the Dietary Sodium Restriction Questionnaire (DSRQ). After obtained written consent from the author, the instrument was translated into Thai versions using the translation-back translation method. The instrument was translated from English into Thai by an independent translator from Academic Development and Service Department, Chulalongkorn University Language Institute. The Thai version of the instrument was evaluated by the researcher in terms of the appropriateness of wording, meaning, and technical terms. Then the questionnaire was translated back into English by another independent translator who works for Academic Development and Service Department, Chulalongkorn University Language Institute. The researcher then compared both versions in the original language and produced a final version.

Demographic questionnaire

The demographic questionnaire was developed by the investigator and used for collecting information regarding demographic and socioeconomic background.

This questionnaire comprises of items concerning age, gender, income, living arrangement, and education. Data were recorded both from the hospital medical record and participant interviewing.

The Dietary Sodium Restriction Questionnaire (DSRQ)

The DSRQ was designed to measure facilitators and barriers to adherence to a low sodium diet. The instrument was developed based on the Theory of Planned Behavior (TPB), the group's clinical and research experience, and knowledge of the literature (Bentley et al., 2009). In addition, the instrument was developed for use not only in clinical practice to guide education and counseling interventions but also in research to assess the factors that affect adherence to low sodium diet in heart failure patients (Bentley, 2006).

The instrument consists of 27 items related to resources, barriers, referents, and attitudes/beliefs about following a low sodium diet. The DSRQ reflects the primary constructs of the TPB and composes of three subscales: attitude, subjective norms, and perceived behavioral control. Score were calculated for each of these subscales.

Attitude toward adherence to low sodium diet. Six items were included in the *attitude* subscale measuring the patient's attitude toward following a low sodium diet. The heart failure patients were asked to rate how much they agree or disagree with each item. A five-point Likert-type scale was used to score each item with 1 corresponding to "strongly disagree" and 5 to "strongly agree." The scores on this subscale were ranged from 6 to 30. Cronbach's coefficient alpha of this subscale was .88. All item-total correlations were ranged from .49 to .78. Furthermore, the inter-item correlations were .33 to .81 for all items (Bentley et al., 2009; Chung et al.,

2006; Lennie et al., 2008). Internal consistency was acceptable with Cronbach's alpha of 0.89 in the pilot study and 0.85 in the main study (see table 5).

Scoring

All subscale items were summed to obtain a total score for attitude. The possible scores on this subscale ranged from 6 to 30 points with higher score indicating better attitude toward adherence to low sodium diet. Attitude levels were categorized into three levels by employing the range between the minimum and the maximum total scores and dividing it by three.

Score	interpretation
6-14	low
15-23	moderate
24-30	high

Subjective norm. Three items made up the subjective norm subscale. The subscale measured the patient's motivation to comply with the beliefs of significant others. The persons with heart failure were instructed to rate how much they agree or disagree with each item. A five-point Likert-type scale was used to score each item with 1 corresponding to "strongly disagree" and 5 to "strongly agree." The scores on this subscale were ranged from 3 to 15. Cronbach's coefficient alpha of this subscale was .62. All item-total correlations were ranged from .41 to .51. The inter-item correlations were between .26 and .43 for all items (Bentley et al., 2009; Chung et al., 2006; Lennie et al., 2008). Internal consistency was fair with Cronbach's alpha of 0.61 in the pilot study and 0.66 in the main study (see table 5).

Scoring

All subscale items were summed to obtain a total score for subjective norms. The possible scores on this subscale ranged from 3 to 15 points with higher score indicating greater motivation to comply with the beliefs of significant others on adherence to low sodium diet. Subjective norms levels were categorized into three levels by employing the range between the minimum and the maximum total scores and dividing it by three.

Score	interpretation
3-6	low
7-10	moderate
11-15	high

Perceived behavioral control. Seven items were included in the perceived behavioral control subscale. The heart failure patients were instructed to indicate how much the items keep them from following a low sodium diet. A five-point Likert-type scale was used to score each item with 1 corresponding to “not at all” and 5 to “a lot”. All items on this subscale were reverse-coded. The scores on this subscale were ranged from 7 to 35. Cronbach’s coefficient alpha of this subscale was .76 and all item-total correlations were ranged between .41 and .61. Furthermore, the inter-item correlations were between .12 and .57 (Bentley et al., 2009; Chung et al., 2006; Lennie et al., 2008). Internal consistency was acceptable with Cronbach’s alpha of 0.78 in the pilot study and 0.83 in the main study (see table 5).

Scoring

All items on this subscale were reverse-coded therefore the item scores were reverse-coded before summed. The summed score obtains a total score for perceived behavioral control. The possible scores on this subscale ranged from 7 to 35 points with higher score indicating higher perceived behavioral control on adherence to low sodium diet. Perceived behavioral control levels were categorized into three levels by employing the range between the minimum and the maximum total scores and dividing it by three.

Score	**interpretation**
7-16	low
17-26	moderate
27-35	high

The DSRQ was also included 11 individual items in which the patient provided information about whether or not they were prescribed a low sodium diet by their healthcare provider, how well they believed they follow the diet, how easy or hard it was to follow the diet and whether they believed the diet has helped their heart failure. These items were not part of any subscale. They were for description only. These 11 individual items were not used in this study. In addition, construct validity of DSRQ was investigated using factor analysis.

In the current study, after translating and back-translating to and from the Thai language, the content validity of DSRQ was investigated by seven experts, including a cardiologist, a cardiovascular nurse, three instructors with expertise in cardiovascular nursing, and two instructors with expertise in research instruments.

The content validity index (CVI) of attitude subscale, subjective norm subscale, and perceived behavioral control subscale were .95, .91, .94, respectively (see table 5).

Intention to adherence to a low sodium diet questionnaire

Intention to adhere to a low sodium diet was measured using a questionnaire. This questionnaire was developed by the researcher based on the TPB and the literature review. According to TPB, behavioral intentions are indications of a person's readiness to perform a behavior (Fishbein & Ajzen, 2010). An intention can find expression in such statements as the following: *I will engage in the behavior*, *I intend to engage in the behavior*, *I expect to engage in the behavior*, *I plan to engage in the behavior* and *I will try to engage in the behavior*. The essential underlying dimension characterizing and intention is the person's estimate of the likelihood or perceived probability of performing a given behavior. This means intention is focused as subjective dimension. Fishbein & Ajzen (2010) believe that the higher this subjective probability, the more likely it is that the behavior will in fact be performed. Although the one-item scale of intention is acceptable and valid for using in research, investigators often use two or more intention items for greater reliability (Fishbein & Ajzen, 2010). Therefore, in the current study, the questionnaire was consisted of three items concerning how much the patients intend to perform adherence to low sodium diet behavior. The response scales were ranged from (1) disagree to (5) strongly agree to perform adherence. The content validity of this instrument was assessed by seven experts including a cardiologist, a cardiovascular nurse, three instructors with expertise in cardiovascular nursing, and two instructors with expertise in research instruments, and the content validity index (CVI) was .80. Concerning the reliability of the questionnaire, the internal consistency was tested

using a pilot study with 30 heart failure patients who had the same characteristics as the sample. The internal consistency of intention questionnaire was .96 which is considered acceptable (Polit, Beck, & Hungler, 2002). In the pilot study, the internal consistency of intention questionnaire was .96 and .89 in the main study (see table 5).

Adherence to low sodium diet

Adherence to low sodium diet was measured using a 3-day food record. The record was modified from food record which developed by Chittchang et al. (2000). Food record can reflect dietary behavior of heart failure patients via the type of food they consumed. It also shows sodium intake from food the heart failure patients consumed. The heart failure patients were asked to record all food items and amount they consumed during 3 days which are 2 weekdays and 1 weekend day. The researcher explained how to record the form to each patient, then rechecked the heart failure patients' understanding and let the participant try to record their food of the previous meal. Furthermore, the manual of food record was given to the participants. Sodium intake was calculated using the INMUCAL program which developed by The Nutrition Institute, Mahidol University.

The 3-day food record and its manual were assessed by seven experts, including a cardiologist, a cardiovascular nurse, three instructors with expertise in cardiovascular nursing, and two instructors with expertise in research instruments. The suggestions were font size, colors of the manual, word using, format, content and so on. The researcher edited the food record and its manual according to the experts' comment. Then, in the pilot study, the participants were asked to evaluate the 3-day food record and the manual. Some participants informed that they did not

know what the word “Low Sodium” means. As a result, the researcher used the word “Low Salt” instead in all of the instruments in this current study.

Data from 3-day food record were analyzed using INMUCAL program into the sodium intake per day. Level of sodium intake per day reflected adherence to low sodium diet in negative direction. The more sodium intake, the less adherence to low sodium diet. The participants were categorized into two groups which were adherence group and non-adherence group based on their sodium intake level. The participants in each NYHA level were non-adherence if their intook more sodium than their prescribed low sodium diet regimen.

NYHA	Non-adherence	Adherence
I-II	Sodium intake >3,000 mg/d	Sodium intake <3,000 mg/d
III-IV	Sodium intake >2,000 mg/d	Sodium intake <2,000 mg/d

Table 5 Psychometric properties of the instruments used in the study

Instruments	Items	Content validity	Internal consistency reliability		
		S-CVI	Original study	Pilot study (N=30)	main study (N=165)
DSRQ: Attitude	6	0.95	.88	0.89	0.85
DSRQ: Subjective norm	3	0.91	0.62	0.61	0.66
DSRQ: Perceived behavioral control	7	0.94	0.76	0.78	0.83
intention	3	0.80	-	0.96	0.89

Protection of human subjects

Prior to data collection, the research proposal was submitted to the Chulalongkorn University Institutional Review Board (IRB) and the Human Research Board of the potential settings as an expedited study. The risks were minimal. The risks might be psychological or social risks and came from the items of the questionnaires which might make the participants feel upset. Therefore, the participants were informed that they can withdraw at any time. No benefits were accrued to the individuals who participate in the study. However, the results of this study can guide the development of specific interventions designed to improve adherence to low sodium diet in Thai persons with heart failure. Improving adherence to the low-sodium diet will reduce hospitalization rates and health-care expenditures.

The informed consent form explained the purpose of the study, benefits, risks, types of questionnaires, time required, and tasks to be completed. Data collection was begun after the approval of the committees. At the clinics, participants were informed about the purpose of the study and their right to refuse or discontinue participating. Participant names were not used in the data; a code number was used to ensure confidentiality. To ensure confidentiality, the data were managed in the following manner: Firstly, participants' names were not appeared in the data; code numbers were used to ensure confidentiality. The identifying list was kept securely and separately. Secondly, the results of the study were presented in total to protect the participants' identity. Lastly, the researcher removed the participants' names from the identifying list as soon as the data were analyzed.

Data collection

1. A letter asking for permission to collect the data from the Faculty of Nursing of Chulalongkorn University was sent to the directors and the Human Research Board of the research settings.

2. After the permission was granted by each IRB, the researcher contacted and made an appointment with the doctors and nurses in each research setting in order to inform them about detail of this research.

3. Each day the researcher was study personal information, medical diagnosis, and medical records of persons with heart failure who had an appointment with the physicians. After that, the researcher identified the patients who met the inclusion criteria and then selected potential study participants by simple random sampling.

4. At the outpatient departments and/or cardiac clinics, the persons with heart failure identified by the follow-up records of the departments were approached by the researcher. In a private room, the researcher introduced herself to potential participants (names, position, workplace, contact information, the authority for this study) face-to-face, and explained the research objectives, the process of the study, and the right to participate, refuses, or discontinues participating in this study. Potential participants were got the time to ask questions before making a decision. If the participants were willing to join the study, they were asked to sign the informed consent form, and they were given a copy.

5. After the informed consent form was signed, the participants were asked to complete all of the self-administered questionnaires in the private room.

6. The researcher checked the completeness of the data in the questionnaires and asked the participants immediately for missing data.

7. Then the researcher explained about a 3-day food record: how to record food you eat in this form, how to use the manual of food record. The participants were asked to try filling the food record form using a previous meal they consumed. Because of 3 day records, until the participants correctly fill the food record, the researcher gave the manual of food record for using at the participants home and the envelop for sending food record back. In addition, the researcher made an appointment to the participant for sending back the 3-day food record.

8. Two or three days later, the researcher called the participants asking how they can fill the food record correctly and gave the suggestions about the food record filling.

10. One week later, the postcards asking for the sending back were sent to the participants who had not returned back the food record.

11. When received the returned food record, the researcher immediately checked the correct and completeness of the data in food record. If the data of food record was not corrected or incompleted, the researcher called the participants asking for more information to make the food record most completed.

Data management

This study collected data from central region of Thailand using paper forms. The data were collected by the principle investigator (PI). The questionnaire were immediately checked for completion after the participants answered the questionnaire in order to prevent missing data. Then the data were entered by the PI into the computer using INMUCAL, SPSS software. Data were kept in the password-protected computer and were accessed by the PI only. Additionally, the

questionnaire, which identified participants' names and the identifying list, were kept securely and separately from the study data.

Data analysis

The nutritional analysis program which is INMUCAL was used for sodium level per day analysis. Statistical analysis of the data was performed using the Statistical Package for the Social Sciences for Windows (SPSS/Windows) program in order to analyze data and provide descriptive statistics. Linear Structural Relationship (LISREL) version 8.72 was employed for the path analysis. An alpha level of .05 was the accepted level of statistical significance for all analyses in this study. The processes of data analysis were as follows:

1. Descriptive statistics were used to describe the characteristics of the sample and to examine the distribution of demographic and other major variables in the study. The researcher used a frequency table to verify incorrectly keyed category variables. Additionally, a summary of descriptive statistics was used to help check the range of variables, number of sample, mean, median, and minimum and maximum values.

2. The assumptions underlying path analysis was tested, including normality of distribution, linearity of the relationship, homogeneity of variance, and multicollinearity. Pearson Product Moment correlations was used to test for bivariate relatiohship among variables and to assess multicollinearity among the variables.

3. The Chi-square, the Goodness of fit index(GFI), and the Root Man Square Error of Approximation(RMSEA) were tested to assess adequacy of model fit to the empirical data as follows.

The Chi-square test (x^2) associates the difference between observed data and the restricted structure resulting from the full model. A model with a poor fit is indicated when the Chi-square is large. Basically, in order to determine fit, the chi-square value should be compared with its associated degree of freedom. Chi-square is relative to degree of freedom. A Chi-square relative to degree (x^2/ df) less than 3 was also accepted for an alternative indicator of goodness-of-fit. The non-significant chi-square values shown in the actual and predicted input matrices were not statistical different. A .05 or .01 significant level is recommended as the minimum accepted.

The Goodness of Fit-Index (GFI) compares the squared residuals from the prediction of the actual data. It represents the overall degree of fit ranging from 0 (poor fit) to 1 (perfect fit). According to Hair and colleagues (2010), higher values of GFI indicate a better fit, but no absolute threshold levels for acceptability has been established. However, values of .09 or above usually indicate a good model fit.

The root mean square error of approximation (RMSEA) is one of the most recently-proposed tests of model fit and is the discrepancy per degree of freedom. Its value represents the goodness of fit that could be expected if the model is estimated in the population, not just the sample drawn for the estimate. The value of the RMSEA is less affected by sample size when compared with the chi-square. The interpretation of the RMSEA value is often considered according to the following levels: 0 = perfect fit; <.05 = close to fit; .05 to .08 = fair fit; .08 to .10 = moderate fit; > .10 = poor fit (Byrne, 1998).

This study used the overall model fit indices, including χ^2, χ^2 / df, GFI, and RMSEA. Schermelleh-Engel, Moosbrugger and Müller (2003, p 52) suggested two

criteria for selecting the overall model fit indices: good criteria and acceptable criteria. The criteria of the overall model fit indexes are presented in table 6

Table 6 Criteria of the overall model fit indices

The overall model fit indexes	Good Criteria	Acceptable Criteria
χ^2	.05 < p ≤ 1.00	.01 < p ≤ .05
χ^2 / df	0 < χ^2 / df ≤ 2	2 < χ^2 / df ≤ 3
GFI	.95 ≤ GFI ≤ 1.00	.90 ≤ GFI ≤ .95
RMSEA	0 ≤ RMSEA ≤ .05	.05 < RMSEA ≤ .08

CHAPTER IV
RESULT

The purpose of this study were to develop and examine the causal relationships between variables including attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, and intention on adherence to low sodium diet in 165 Thai persons with heart failure. The findings are illustrated as follows:

Characteristics of the study participants

In this study, a total of 165 participants who were persons with heart failure were included in the analysis. The result showed that the mean age of the participants was 55.65 years old (SD= 14.16, range = 21-85). More than a half of the participants were male (57%). Nearly a half of the participants had income less than 5000(47%). The majority of the participants living with caregiver (89.1%), and have no education or completed primary education (50.3%) (see table 7).

Table 7 Demographic characteristics of the study participants (N=165)

Characteristics	N	%
Age (years)		
Less than or equal 30	7	4.2
31-45	34	20.6
46-60	61	36.9
61-75	51	30.9
76 and over	12	7.3
Mean = 55.65, SD=14.16, Range 21-85		
Gender		
Male	94	57.0
Female	71	43.0
Income (Baht per month)		
Less than 5000	79	47.9
5001-10000	25	16.3
10001-20000	29	17.6
20001-30000	13	7.9
More than 30000	17	10.3
Mean = 12,687.67, SD=15,962.76		
Living arrangement		
Living with Caregiver	147	89.1
Living alone	18	10.9
Education		
Primary education and lower	83	50.3
Secondary education/vocational certificate	46	27.9
bachelor education/vocational diploma	23	13.9
higher than bachelor education	13	7.9

Moreover, nearly a half of the participants had NYHA FC I (44.8%), ejection fraction less than 40% (43.0%). The majority of the participants had co-morbidity (78.8%), and had 2 condition of co-morbidity (27.9%). More than half of the participants had hypertension as a condition of co-morbidity (61.8%) (See table 8).

Table 8 Clinical characteristics of the study participants (N=165)

Characteristics	N	%
The New York Heart Association (NYHA) Functional Classification		
FC I	74	44.8
FC II	68	41.2
FC III	22	13.3
FC IV	1	0.7
Ejection Fraction (%)		
< 40	71	43.0
40-54	30	18.2
55-70	27	16.4
>70	17	10.3
Not applicable	20	12.1
Number of Co-morbidity		
None	35	21.2
1	33	20.0
2	46	27.9
3	38	23.0
4	13	7.9
Type of comorbidity*		
Hypertension	102	61.8
Diabetes	72	43.6
Dyslipidemia	80	48.5
Kidney insufficiency	23	13.9
Thyroid	7	4.2
COPD	1	0.6
Cirrhosis	2	1.2
Gout	3	1.8
SLE	1	0.6

Note. ***** = multiple responses

Characteristics of the study variables

Five major variables were explored in the current study included attitude toward adherence to low sodium diet, subjective norms, perceived behavioral control, intention, and adherence to low sodium diet. The characteristics of each major variable were described as follows:

Attitude toward adherence to low sodium diet

The total scores of the attitude ranged from 16 to 30 points with a mean of 25.67 (SD=3.31). The attitude scores had negative skewness value (-.271) which indicating that most of the participants had attitude scores higher than mean scores. In addition, the kurtosis value of attitude was negative (-.749), suggesting likely a flattened curve shape of attitude scores. The findings regarding the mean score, skewness, and the kurtosis value indicated that the participants as a whole had a high attitude to adherence to low sodium diet (see Table 9)

Subjective norms

The total scores of the subjective norms ranged from 7 to 15 points with a mean of 12.78 (SD=1.78). The subjective norms scores had negative skewness value (-.546) which indicating that most of the participants had subjective norms scores higher than mean scores. In addition, the kurtosis value of subjective norm was negative (-.045), suggesting likely a flattened curve shape of subjective norm scores. The findings regarding the mean score, skewness, and the kurtosis value indicated that the participants as a whole had a high subjective norm to adherence to low sodium diet (see Table 9)

Perceived behavioral control

The total scores of the perceived behavioral control ranged from 7 to 35 points with a mean of 21.67 (SD=5.92). The perceived behavioral control scores had positive skewness value (.117) which indicating that most of the participants had perceived behavioral control scores lower than mean scores. In addition, the kurtosis value of perceived behavioral control was negative (-.268), suggesting likely a flattened curve shape of perceived behavioral control scores. The findings regarding the mean score, skewness, and the kurtosis value indicated that the participants as a whole had a moderate perceived behavioral control to adherence to low sodium diet (see Table 9)

Intention

The total scores of the intention ranged from 8 to 15 points with a mean of 13.31 (SD=1.60). The intention scores had negative skewness value (-.356) which indicating that most of the participants had intention scores higher than mean scores. In addition, the kurtosis value of intention was negative (-.724), suggesting likely a flattened curve shape of intention scores. The findings regarding the mean score, skewness, and the kurtosis value indicated that the participants as a whole had a high intention to adhere to low sodium diet restriction (see Table 9)

Table 9 Descriptive statistics of TPB constructs

variable	Possible Range	Actual range	Mean	SD	Skewness (SE=.189)	Kurtosis (SE=.376)	Level
Attitude	6-30	16-30	25.67	3.31	-.271	-.749	high
Subjective norms	3-15	7-15	12.78	1.78	-.546	-.045	high
Perceived behavioral control	7-35	7-35	21.67	5.92	.117	-.268	moderate
Intention	3-15	8-15	13.31	1.60	-.356	-.724	high

Adherence to low sodium diet

The total amount of averaged sodium intake ranged from 367.18 to 13,932.55 mg/day with a mean of 3,243.87 mg/day (SD=1746.69). The amount of sodium intake had positive skewness value (2.986) which indicating that most of the participants intake sodium per day lower than mean scores. In addition, the kurtosis value of the amount of sodium intake was positive (15.910), suggesting that the amount of sodium intake per day were shaped like a peakedness curves. The findings regarding the mean score, skewness, and the kurtosis value indicated that the participants as a whole had a higher level of sodium intake than sodium recommendation (see Table 10)

Table 10 Descriptive statistics of adherence to low sodium diet (mg/day)

variable	Possible Range	Actual range	Mean (SD)	Skewness	Kurtosis	Level
Adherence to low sodium diet	As possible	367.18-13,932.55	3,243.87 (1,746.69)	2.986	15.910	Higher than recommend

In this study, a total of 165 participants were included in the analysis. The result showed that approximately a half of the participants were adherent (50.91%). Nearly a half of the participants were non-adherent (49.09%). In terms of NYHA, The majority of the participants who had NYHA I-II were adhered (49.09%), whereas the majority of the participants who had NYHA III-IV were non-adhered (12.12%) (see table 11).

Table 11 the number and percentage of adherence and non-adherence group (N=165)

NYHA	Non-adherence		Adherence	
	N	%	N	%
I-II	61	36.97	81	49.09
III-IV	20	12.12	3	1.82
Total	81	49.09	84	50.91

3. Preliminary Analysis

Data cleaning

Before the data were analyzed, the researcher checked the original data against the computerized data file in order to examine the accuracy of the data entry and for missing values. Descriptive statistics especially the frequency of each variable was performed. The researcher created frequency tables that described the member of each variable in order to check for data values and missing values.

In order to conduct path analysis, the statistical assumption testing should be performed. Normality, linearity, homoscedasticity, and multicollinearity were tested to ensure that the statistical assumption was not vilolated. The results of normality, linearity, homoscedasticity, and multicollinearity testing are as follow.

3.1 Normality

Descriptive statistics including mean, standard deviation, skewness, and kurtosis were considered to test normality of variables. Perfect normal distribution needs a skewness of 0. The skewness more than 0 reflects a positive skewed distribution whereas the skewness less than 0 shows negatively skewed (Acock, 2012). Hair et al., (2010) suggests that the skewness values falling outside the range of -1 to +1 indicate skewed distribution. In case of kurtosis, the normal distribution has a kurtosis of 3.00. The kurtosis less than 3.00 shows that the tails are too thick which means the curve is flat whereas the kurtosis more than 3.00 indicates the tails are too thin (peaked curve). Despite the skewness and kurtosis values being above +2.58 indicating non-normal distributions (Hair et al., 2006), West and colleagues (1995) suggested the high of normal and non-normal are greater than 3.00 for skewness and 21.00 for kurtosis. In the current study, the skewness of major variables

ranged from -.546 to 2.986 and the kurtosis of the variables ranged from -7.49 to 15.910. Almost of the variables were within the normal curve except income and adherence to low sodium diet congruent with Q-Q plot (see Appendix F).

3.2 linearity

Multiple regression assumes that the independent variables and the dependent variable have a linear relationship, testing by the residual plot (Hair et al, 2010). In this step, the relationships between the study variables were investigated through a residual plot using the SPSS program. The residual plot showed such a linear relationship in the current study (see Appendix F).

3.3 homoscedasticity

This assumption can be assessed by the residual scatter plot as well. The spread of residual variables around the zero axis within a ± 2 standard deviation indicated this assumption was not violated. In the current study, the scatter plot of residuals revealed the results from homoscedastic data (see Appendix F).

3.4 multicollinearity

Multicollinearity occurs when two or more predictor variables in a multiple regression model are highly correlated. Multicollinearity can be examined by Pearson's correlation coefficients, tolerance values and the variance inflation factor (VIF). The correlation of two variables that does not exceed ± .9 indicates that there is no multicollinearity (Tabachnick & Fidell, 2006). In the current study, three variables including gender, living arrangement, and education are category scale. Therefore, these three variables were change to dummy variables before entered to the bivariate correlation analysis. The correlation coefficients among variables range from -.237 to .518 (see Table 12). Tolerance and VIF use for multivariate

multicollinearity testing. Normal range of tolerance is 0 to 1. Multicollinearity occurs when the tolerance values approaches zero. Additionally, the variance inflation factor (VIF) are greater than 10 shows multivariate multicollinearity. The tolerance ranged from .62 to .93 (not approaching 0) and the VIF ranged from 1.07 to 1.46 (not greater than 10) therefore, evidence of multicollinearity was not found in the current study (see Table 13).

Table 12 Bivariate relationship among variables

Variables	X1	X2	X3	X4	X5
X1	1.00				
X2	.08	1.00			
X3	.02	.52**	1.00		
X4	.03	.11	.05	1.00	
X5	.02	.42**	.35**	.22**	1.00

Note. **p<.01

X1 = Adherence to low sodium diet

X2 = Attitude toward adherence to low sodium diet

X3 = Subjective Norms

X4 = Perceived Behavioral Control

X5 = Intention

Table 13 Assessment for multicollinearity among the predicting variables

variables	Tolerance	VIF
Attitude	.62	1.62
Subjective Norms	.68	1.46
PBC	.92	1.08
Intention	.69	1.44

In summary, the results of the assumption testing in this study indicated evidences violated to the assumption for multiple regression and path analysis regarding normality. The data were non normal distribution. Therefore, LISREL with Robust Maximum likelihood estimation technique was used.

4. Study result

The purpose of this study was to investigate the relationships among variables including attitudes toward adherence to low sodium diet, subjective norms, perceived behavioral control, intention, and adherence to low sodium diet in Thai heart failure patients, with the following hypotheses tested.

1. Attitude toward adherence to low sodium diet has a positive indirect effect on adherence to low sodium diet in Thai persons with heart failure through intention.

2. Subjective norms has a positive indirect effect on adherence to low sodium diet in Thai persons with heart failure through intention.

3. Perceived behavioral control has a positive direct effect on adherence to Low sodium diet in Thai persons with heart failure and has a positive indirect effect on adherence to low sodium diet through intention.

4. Intention has a positive direct effect on adherence to low sodium diet in Thai persons with heart failure.

Model identification

A hypothesized path model was drawn from the Theory of planned behavior and empirical literature. A path model using the LISREL 8.72 program was employed in order to answer the research questions and test research hypotheses. Identification path model is a crucial process before testing a model. There are three kinds of identification which are over-identification, justidentification, and under-identification. Over-identification is one with more data points than free parameters. The data point came from the formula (p(p+1))/2, where p equals the number of observed variables (Tabachnick & Fidell's, 2007). The hypothesized model consisted of 5 variables and 27 free parameters. According to the formula, the number of data points was 15. The hypothesized model had fewer parameters than data points, thus the model is over-identified which means it can be identified.

Model testing

The model has 3 exogenous latent variables (attitude, subjective norms, perceived behavioral control) and 1 mediating variable (intention) and one endogenous latent variable (adherence to low sodium diet). The initially model as in Figure 5

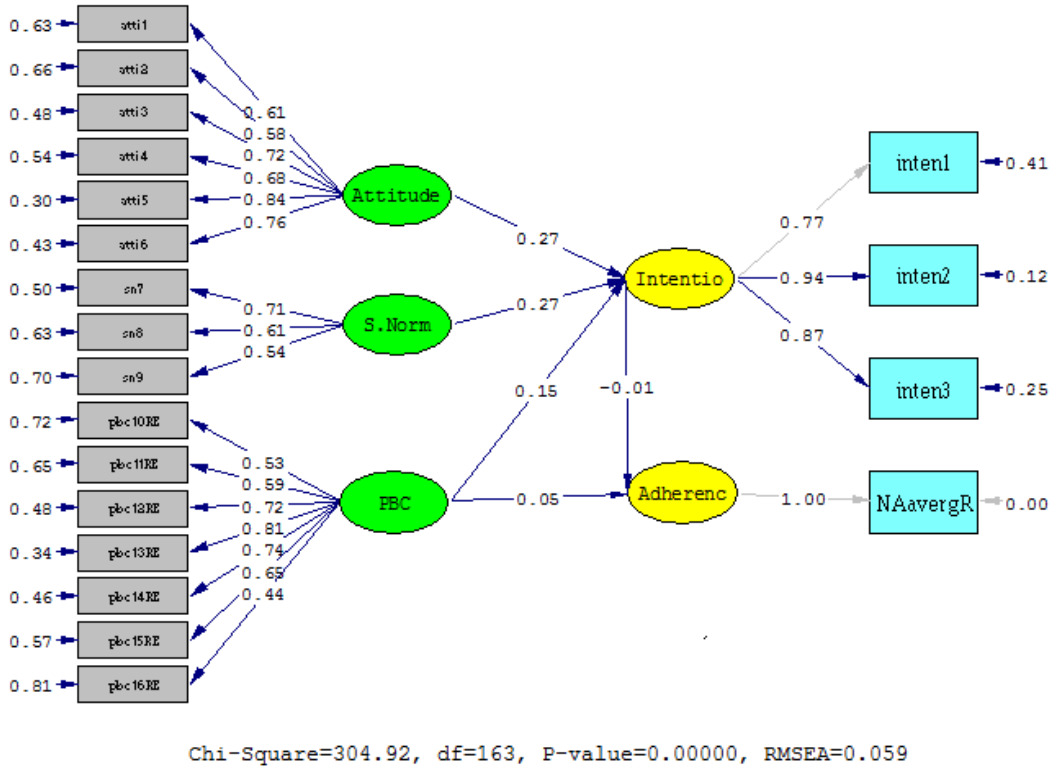

Figure 5 The initially model of adherence to low sodium diet

When examining the parameter estimates in the hypothesized model, no any parameters were constrained or fixed. The results revealed that the fit index statistics were not within an acceptable range which were χ^2 = 304.92, df=163, P-value=0.00, RMSEA=0.059. This meant the initial model had not fit to the empirical data(see Figure 5). The model modification was needed.

In the modification step, the error terms of variables in the model were reconsidered. Some correlation errors were added to the model in order to drop in the Chi-square. The results revealed that the fit index statistics were within an acceptable range which were χ^2 = 164.96, df=150, P-value=0.19, RMSEA=0.000. Furthermore, corresponding to the path coefficient, 2 paths were statistically

significant (see Figure 6). As a result, the final model had a better fit with the empirical data.

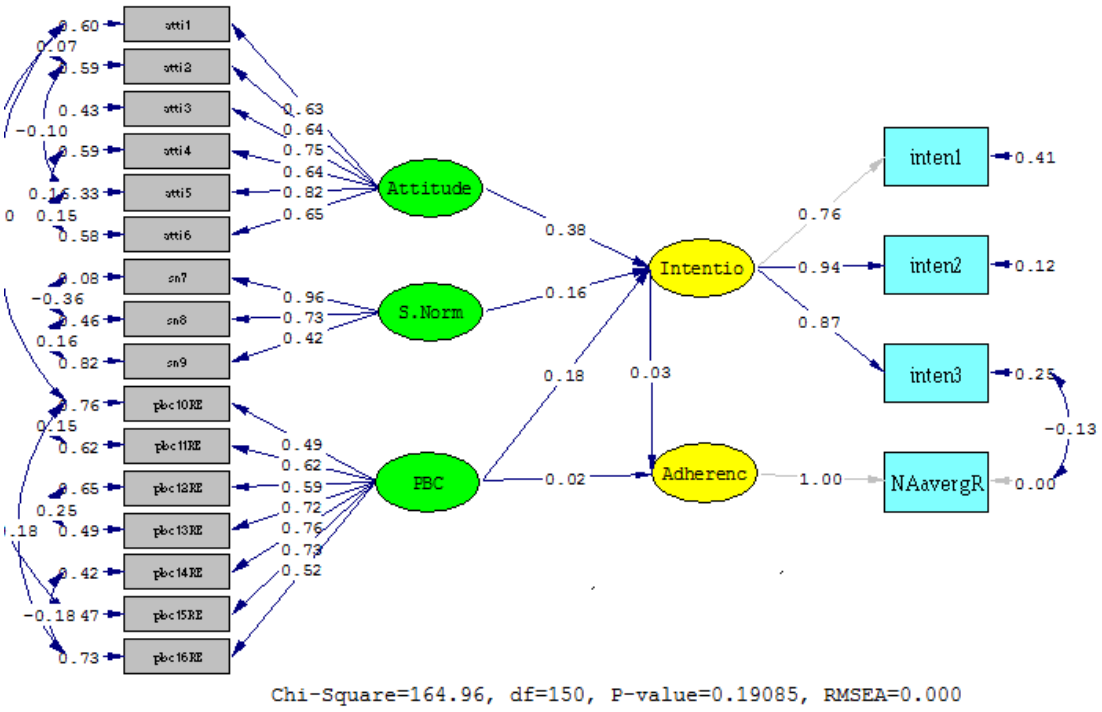

Figure 6 The final model of adherence to low sodium diet in persons with heart failure

Table 14 Comparison of the Goodness of Fit indices between the initial model and

Goodness of Fit Indices	Initial model	Final model
χ^2	304.92	164.96
p-value	0.00	0.19
χ^2 / df	1.87	1.09
RMSEA	0.073	0.000
GFI	0.84	0.91

Note. Abbreviations: χ^2, Chi-square; df, degree of freedom; RMSEA, Root Mean Square Error of Approximation; GFI, Goodness of fit Index; AGFI, Adjust Goodness of Fit Index

Table 15 Standardized Path coefficients, Standard error(SE), and T-value of parameters of the final model of adherence to low sodium diet

Path diagram	Standardized Path coefficients	SE	T-value
GAMMA			
Attitude ⟶ Intention	0.38	0.10	3.79*
Subjective norms ⟶ Intention	0.16	0.10	1.56
PBC ⟶ Intention	0.18	0.07	2.52*
PBC ⟶ Adherence	0.02	0.04	0.35
BETA			
Intention ⟶ Adherence	0.03	0.04	0.41

Note. ***P<.05**

Table 16 Total, indirect, and direct effects of the causal variables on affected variables of the final model of Adherence to low sodium diet

Causal variables	Affected variables					
	Intention			Adherence		
	DE	IE	TE	DE	IE	TE
Attitude	0.38**	-	0.38**	-	0.01	0.39
Subjective norms	0.16	-	0.16	-	0.00	0.16
PBC	0.18**	-	0.18**	0.02	0.00	0.02
Intention	-	-	-	0.03	-	0.03
R^2	0.30			0.00		

Note. * $p < 0.05$, DE = direct effect, IE=indirect effect, TE=total effect

The results of final model testing are summarized as follows (see Table 4.9)

Regarding the influence of attitude on intention, it had a significant direct effect (0.38, p<.05) and had a non-significant indirect influence on adherence through intention (0.01, p>.05). Thus, the total effect of attitude on adherence was 0.39 (p>.05).

Regarding the influence of subjective norms on intention, it had a non-significant direct effect (0.16, p>.05) and had a non-significant indirect influence on adherence through intention (0.16, p>.05). Thus, the total effect of subjective norms on adherence was 0.16 (p>.05).

Regarding the influence of perceived behavioral control on intention, it had a significant direct effect (0.18, p<.05) and had a non-significant indirect influence on adherence through intention (0.02, p>.05). In addition, perceived behavioral control had a non-significant direct influence on adherence (0.02, p>.05) Thus, the

total effect of perceived behavioral control on adherence was 0.20 (p>.05).

Regarding the influence of intention on adherence to low sodium diet, it had a non-significant direct effect (0.03, p>.05). Thus, the total effect of intention on adherence was 0.03 (p>.05).

Hypothesis testing

Four hypotheses and their direct and indirect effects were estimated. A summary of the effects of the causal variables on the affected variables is presented in table 4.9. The hypotheses of the proposed path analysis model of adherence to low sodium diet in heart failure patients were examined and the findings were as follows.

Hypothesis 1 Attitude has a positive indirect effect on adherence to low sodium diet in heart failure patients through intention.

Attitude had a significant positive direct effect on intention (0.38, p<.05) and had a non-significant positive indirect influence on adherence through intention (0.01, p>.05). Thus, the hypothesis one is not supported.

Hypothesis 2 Subjective norms has a positive indirect effect on adherence to low sodium diet in heart failure patients through intention.

Regarding the influence of subjective norms on intention, it had a non-significant direct effect (0.16, p>.05) and had a non-significant indirect influence on adherence through intention (0.16, p>.05). Thus, the hypothesis two is not supported.

Hypothesis 3 Perceived behavioral control has a positive indirect effect on adherence to low sodium diet in heart failure patients through intention.

Regarding the influence of perceived behavioral control on intention,

It had a significant direct effect (0.18, p<.05) and had a non-significant indirect Influence on adherence through intention (0.02, p>.05). In addition, perceived Behavioral control had a non-significant direct influence on adherence (0.02, p>.05) Thus, the hypothesis three is not supported.

Hypothesis 4 Intention has a positive direct effect on adherence to low sodium diet in Heart failure patients.

Intention had a nonsignificant positive direct effect on adherence to low sodium diet (0.03, p>.05). Thus, the hypothesis four is not supported.

In summary, the descriptive static characteristics of study variables have been explained. The preliminary analysis demonstrated that the assumptions for path analysis were not violated except normality. Following this, the hypothesized path model of adherence to low sodium diet was analyzed and modified. The final path model fits with the empirical data. Most of the research hypotheses were not supported. In addition, the model retained significance and is practical for explaining factors affecting intention in persons with heart failure. As a final point, all the variables in the final model cannot explain the variance in overall adherence to low sodium diet.

CHAPTER V
DISCUSSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter discussed the results of the study and provided the conclusion, discussion, implications, and recommendations for the future research.

Conclusion

The descriptive design was used for answering the research questions. The objective of the study was to develop and examine the causal relationships among variables including attitudes, subjective norms, perceived behavioral control, intention, and adherence to low sodium diet in Thai persons with heart failure. The theory of planned behavior was used as the conceptual framework for this current study.

The total of 235 persons with heart failure were recruited into the study, 172 participants returned back the 3-day food record, giving a response rate of 73.19 % but only 165 participants provided the completed data of the 3-day food record. The sample in this study was a group of patients living with heart failure who attended outpatient departments or cardiac clinic of the public hospitals in Thailand, have no critical conditions or serious complications, and met inclusion criteria as follows: 1) Diagnosed with all stages of heart failure alone or diagnosed with their baseline diseases and reported symptoms of heart failure in the medical record 2) the patients get the recommendation from healthcare providers to follow a low sodium diet. 3) Age between 18 years old and over 4) No cognitive impairment 5) Able to communicate in Thai 6) Willing to participate in this study. Patients were not included if met the exclusion criteria: have critical conditions or serious

complications such as orthopnea, abnormal (cyclic) breathing (Cheyne-Stokes respiration), pulmonary edema, cerebral hypoxia or have psychiatric problem.

The data collection tookplace at the outpatient department and/or cardiac clinic of the 6 public tertiary care hospital in Central region of Thailand. Structured questionnaires were employed for data collecting including The Dietary Sodium Restriction Questionnaire (DSRQ), Intention to adherence to a low sodium diet questionnaire, and a 3-day food record. Data collection was carried out from January to June 2014. INMUCAL was used for the analysis of sodium level per day. Statistical analysis of the data was performed using the Statistical Package for the Social Sciences for Windows (SPSS/Windows) and LISREL 8.72 program was used to test hypothesized model.

The result revealed that the mean age of the participants was 55.65 years old (SD= 14.156, range = 21-85). More than a half of the participants were male (57%). Nearly a half of the participants had income less than 5000(47%). The majority of the participants living with the carer (89.1%), and have no education or completed primary education (50.3%). The participants had a positive attitude toward adherence to low sodium diet (mean=25.67, SD=3.31), a good subjective norms (mean=12.78, SD=1.78), fair perceived behavioral control (mean= 20.33, SD=5.92).

In addition, the participants had a high level of intention to perform adherence to low sodium diet behavior (mean= 13.31, SD=1.60). The total amount of averaged sodium intake ranged from 367.18 to 13,932.55 mg/day with a mean of 3,243.87 (SD=1,746.69). Approximately a half of 165 participants were adherent (50.91%). Nearly a half of the participants were non-adherent (49.09%). In terms of NYHA, The majority of the participants who had NYHA I-II were adhered (49.09%),

whereas the majority of the participants who had NYHA III-IV were non-adhered (12.12%).

Regarding the influence of attitude on intention, it had a significant direct effect (.38, $p<.05$) and had a non-significant indirect influence on adherence through intention (.01, $p>.05$). Thus, the total effect of attitude on adherence was .39 ($p>.05$).

Regarding the influence of subjective norms on intention, it had a non-significant direct effect (.16, $p>.05$) and had a non-significant indirect influence on adherence through intention (.16, $p>.05$). Thus, the total effect of subjective norms on adherence was .16 ($p>.05$).

Regarding the influence of perceived behavioral control on intention, it had a significant direct effect (.18, $p<.05$) and had a non-significant indirect influence on adherence through intention (.02, $p>.05$). In addition, perceived behavioral control had a non-significant direct influence on adherence (.02, $p>.05$) Thus, the total effect of perceived behavioral control on adherence was .20 ($p>.05$).

Regarding the influence of intention on adherence to low sodium diet, it had a non-significant direct effect (.03, $p>.05$). Thus, the total effect of intention on adherence was .03 ($p>.05$).

Discussion

Demographic factors

Although some previous studies revealed that demographic factors are affect adherence to dietary behavior, in the present study, demographic factors which were age, gender, living arrangement, income, and education were not related to adherence to low sodium diet. In one study, elderly heart failure patients were more

compliant with diet than were their younger counterparts (Evangelista et al., 2003). The younger patients are more likely non-adhere to dietary restriction (Hailey & Moss, 2000; Kutner et al, 2002). The finding of the current study was not support these previous findings. Because the range of the participant age in this study was wide. The age of the participants was between 21 to 85. Additionally, the number of the participants in each age group was not quite different. This may lead to the non-significant result. For gender, in another study, women were more adherent to the sodium-restricted diet than men (Chung et al., 2006). In this study, gender could not predict adherence to low sodium diet. The number of female in the study was similar to the number of male, the difference of the score may be difficult to find. In addition, the participants had quite average income which means they had no problem about the budget to buy low salt diet. For the education, most of the participants got the secondary education so they can find the information about low sodium diet restriction in many ways.

Attitude, Subjective norms, Perceived behavioral control and Intention

The participants as a whole had a positive attitude, a good subjective norms, a fair perceived behavioral control, and a high intention to adhere to low sodium diet. Some patients had an experience about the clinical heart failure symptoms such as dyspnea, orthopnea, PND, lower extremity edema. In that case, they realized that when they control sodium intake, the symptoms are less severity. As a result, the essential of sodium diet restriction is occurred. The patients, so, have a positive attitude to adherence to low sodium diet. In Thai culture, most of the patients always believe and follow the recommendation from the health care providers. In addition, when the member of the family is sick or has any problems, other member

always be concerned. In case of chronic disease, heart failure, for example, mostly the relative will assign the duty for take care the patients including cooking related to patients' disease. The intention in this study is high, however, eating is the pleasure for the individuals. The patients maybe cannot control their self for sodium restriction due to the taste of low sodium food. The perceived behavioral control therefore was in fair level.

Adherence to low sodium diet

The total amount of averaged sodium intake ranged from 367.18 to 1,3932.55 mg/day with a mean of 3,243.87 (SD=1,746.69). In the general population, the American Heart Association recommends that dietary NaCl be restricted to no more than 6.0 g/day (Kotchen & Kotchen, 2006). For heart failure patients, in general, a 2-gram sodium diet is frequently recommended (Grady et al., 2000). Several practices have suggested limiting sodium to a maximum of 3 grams per day for mild to moderate heart failure, while patients with severe heart failure should be limited to less than 2 grams of sodium per day. However, a 3-gram-per-day restriction may be a more realistic goal for patients with mild to moderate heart failure (House-Fancher & Foell, 2004; Grady et al., 2000). It seems the participants took more sodium than the recommendation. There are several ingredients which have sodium in Thai food such as fish source, "kapi", and so on. In addition, there is some hidden sodium in food which the patients may be not concerned and awared.

Hypothesis testing

The findings reveal that partly of the model suggested by TPB was supported in this study.

Hypothesis 1 Attitude has a positive influence on adherence to low sodium diet in heart failure patients through intention

Our results demonstrated that attitude had direct effect on intention but no indirect effect on adherence. The results also showed that R^2 of intention was 30 % indicating that influencing variables explained 30% of intention. However, all influencing variables cannot explained the variance of adherence (R^2 =0.00). These findings may influenced by the measurement of adherence in this study. Adherence of this study was measured using 3-day food record that might be too difficult to Thai persons with heart failure to give accurately report. Response rate of the participants on food record was 73.19% indicating acceptable rate. However, researcher had to call back to the participant to confirm completeness of the data. Most of the participant had primary education or secondary education level (78.2%) which might effects the accuracy of the data.

The findings of this study partly supported influence of attitude on intention of Thai persons with heart failure, but did not support influence of attitude on adherence through intention. According to the conversation with some participants, if the participants had ever got some exacerbation of heart failure symptoms, then they adhere the low sodium diet. In this case the participants realize about the important of adherence and intently follow the recommendation. Appropriate measurement of adherence to low sodium diet should be reconsidered.

Hypothesis 2 Subjective norms have a positive influence on adherence to low sodium diet in heart failure patients through intention.

The findings of this study indicated that subjective norms had no positive significant direct and indirect effect on intention as proposed by TPB. In addition, our finding showed no indirect effect of subjective norms on adherence through intention. Explanation of this result is similar to the explanation on hypothesis 1 testing as mentioned above.

The findings of this study did not support influence of subjective norm on intention of Thai persons with heart failure and did not support influence of subjective norms on adherence through intention. Appropriate measurement of adherence to low sodium diet should be reconsidered.

Furthermore, in Asian cultures when a person is sick, family members will take turns as caretaker and stay with the patient around the clock, if possible. It is also not uncommon that the family will try to take care of the patient in a way that may seem “infantilizing” from an American viewpoint, such as spoon feeding the sick person (Nilchaikovit et al., 1993). This is rarely found in the American context, where an ideal of independence is highly cherished. This behavior of the family may lead the participants feeling frustrated and the response may be the opposite to adherence.

Hypothesis 3 Perceived behavioral control has a positive influence on adherence to low sodium diet in heart failure patients through intention.

Our results indicated that perceived behavioral control had positive significant direct effect on intention as proposed by TPB. However, our finding showed no effect of perceived behavioral control on adherence through intention.

The findings of this study partly supported influence of perceived behavioral control on intention of Thai HF participants, but did not support influence of perceived behavioral control on adherence through intention.

Hypothesis 4 Intention has a positive influence on adherence to low sodium diet in heart failure patients through intention.

The result showed that intention non-significant direct effect on adherence to low sodium diet of the participants (β= .03, p > .05). According to the TPB, intention has positive affect on adherence to low sodium diet. Since adherence to low sodium diet can be differently defined and measured. Objective method using 24-hour urine excretion is the most common method use an can accounted for 95-98% of dietary sodium intake. Thus this method is accepted as an accurate measurement (Yan & Boan, 2006). However, this method needs strong co-operation from the participants, difficult to collect, high cost method, and can be limited for measurement equipment especially in Thailand. Researcher decided to use 3-day food record to measure adherence to low sodium diet. Nevertheless, results of this study pointed out questionable of this method in Thai patients with heart failure. Further studies are needed to explore appropriate measurement tools for adherence on low sodium diet for Thai population.

Furthermore, there are some other uncontrolled environment factors which not be focused in the theory of planned behavior, therefore, these factors were not included in the study. For example, the availability of low salt diet, probably the participants cannot eat or take the low salt diet as they intend because they cannot buy it or it is difficult to select the low salt diet. In Thai context, people mostly buy foods at the open-air market where most of the food packages have no nutrition

label. As a result, it is hard to select the appropriate food for Thai persons with heart failure. Another contributing factor may be the particular kinds of taste. From the data collection, the participants who love salty diet always complain high difficulty of change their food taste to low salt diet.

Implications for nursing science, nursing practice, and nursing education

1. This study provides specified knowledge and greater understanding about relationships among the selected variables in heart failure patients.

2. The information from this study can be usefully used in planning appropriate nursing interventions for heart failure patients. Nurses can use the findings of this study to develop research and nursing interventions in order to enhance heart failure patients' adherence to low sodium diet.

Limitation of the study

1. The sample size was quite small for causal model analysis.

2. The characteristics of the measurement of adherence to low sodium diet which is the 3-day food record may be too hard to answer for the Thai persons with heart failure. It meant this instrument may not appropriate tool for data collection among Thai participants.

3. There may have some other uncontrolled environment factors influencing adherence to low sodium diet at home, such as availability of food and food selection of family member, etc.

Recommendations for future research

1. The other related variables should be included such as food taste, availability of food. The previous food taste of the patients may be one of the important factors that obstacle patients to change their dietary behavior.

2. The longitudinal study should be taken. As the previous studies, most of the studies were cross-section research which may be not enough to explore adherence to low sodium diet. Furthermore, the measure of adherence to low sodium diet should be developed and tested in Thai context.

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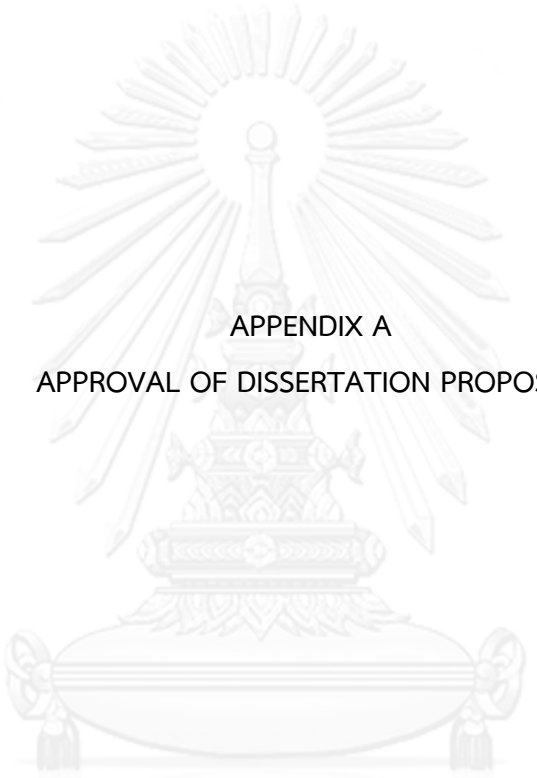
APPENDICES

APPENDIX A

APPROVAL OF DISSERTATION PROPOSAL



ประกาศ
คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
เรื่อง การอนุมัติหัวข้อดุษฎีนิพนธ์ ครั้งที่ 5/2556 ประจำปีการศึกษา 2556

ตามที่คณะพยาบาลศาสตร์ ได้มีประกาศ เรื่อง การอนุมัติหัวข้อดุษฎีนิพนธ์ ครั้งที่ 4/2553 ประจำปีการศึกษา 2553 ประกาศ ณ วันที่ 12 พฤษภาคม 2554 และครั้งที่ 1/2556 ประจำปีการศึกษา 2556 ประกาศ ณ วันที่ 24 กรกฎาคม 2556 แล้วนั้น เนื่องจากมีการปรับแก้บางส่วน จึงขอยกเลิกประกาศหัวข้อวิทยานิพนธ์ ของ **น.ส.สินีนุช เสนีวงศ์ ณ อยุธยา, นางสุชาดา เรืองรัตนอัมพร และนางวัชรินทร์ วุฒิรณฤทธิ์** ในประกาศฉบับดังกล่าว และใช้ประกาศฉบับนี้แทนดังนี้

นิสิตผู้ทำวิจัยและอาจารย์ที่ปรึกษาดุษฎีนิพนธ์

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อาจารย์ที่ปรึกษาหลัก	รองศาสตราจารย์ ดร. จินตนา ยูนิพันธุ์
อาจารย์ที่ปรึกษาร่วม	ผู้ช่วยศาสตราจารย์ ดร. ชนกพร จิตปัญญา
กรรมการ	รองศาสตราจารย์ ดร. วราภรณ์ ชัยวัฒน์
กรรมการภายนอก	รองศาสตราจารย์ ดร. ศิริเดช สุชีวะ
กรรมการภายนอก	**ศาสตราจารย์ นพ. รุ่งโรจน์ กฤตยพงศ์**
ชื่อหัวข้อดุษฎีนิพนธ์	ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย FACTORS INFLUENCING ADHERENCE TO LOW SODIUM DIET IN HEART FAILURE PATIENTS
ครั้งที่อนุมัติ	5/2556
ระดับ	ปริญญาเอก

วิไรพร ธนศิริวงศ์
1 ก.ค. 57

APPENDIX B
APPROVAL OF THE IRB

IRB ที่ 2/2557

คณะกรรมการพัฒนากระบวนการวิจัยโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ

ชื่อเรื่องวิจัย ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย
(FACTORS INFLUENCING ADHERENCE TO LOW SODIUM DIET IN HEART FAILURE PATIENTS)

ผู้วิจัย นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา

หน่วยงาน นิสิตพยาบาลศาสตรดุษฎีบัณฑิต
คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

คณะกรรมการพัฒนากระบวนการวิจัยโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติพิจารณาแล้ว อนุญาตให้ดำเนินการวิจัยในโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติได้

ลงนาม.....
(รองศาสตราจารย์ นายแพทย์ดิลก ภิยโยทัย)
ประธานคณะกรรมการพัฒนากระบวนการวิจัยฯ
อนุมัติ ณ วันที่ 17 เดือน มกราคม พ.ศ.2557

หมายเหตุ : ขอให้ส่งผลงานวิจัยฉบับสมบูรณ์ให้โรงพยาบาลธรรมศาสตร์ฯ จำนวน 1 ชุด

บันทึกข้อความ

ส่วนราชการ คณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลราชบุรี(กลุ่ม พรส.) โทร.๑๒๔๕
ที่ รบ.๐๐๓๒.๑๐๒.๑/ ๐๔๖ วันที่ ๖ พฤศจิกายน ๒๕๕๗
เรื่อง อนุญาตการดำเนินงานวิจัยในโรงพยาบาลราชบุรี

เรียน นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา

สืบเนื่องจากการพิจารณาของคณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลราชบุรี ประจำปีงบประมาณ ๒๕๕๗ ชื่อผลงานวิจัย"ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย" ผู้วิจัยหลัก นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ผลการพิจารณา **อนุมัติ** ให้ผู้วิจัยสามารถดำเนินการวิจัยในโรงพยาบาลราชบุรีตามโครงร่างงานวิจัยที่เสนอต่อคณะกรรมการเพื่อพิจารณา

จึงเรียนมาเพื่อทราบ

(นายสุพจน์ จิระราชวโร)
ประธานคณะกรรมการจริยธรรมการวิจัยในมนุษย์
โรงพยาบาลราชบุรี

คณะกรรมการจริยธรรมการทำวิจัยในคนโรงพยาบาลพระนครศรีอยุธยา

โครงการวิจัย ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย

ผู้วิจัยหลัก นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา
นิสิตชั้นปริญญาดุษฎีบัณฑิต คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

สถานที่ดำเนินการวิจัย โรงพยาบาลพระนครศรีอยุธยา

เอกสารที่พิจารณา โครงร่างวิจัย

วันที่พิจารณาอนุมัติ

คณะกรรมการวิจัยโรงพยาบาลพระนครศรีอยุธยา ได้พิจารณาโครงการฉบับภาษาไทยแล้ว คณะกรรมการฯ พิจารณาอนุมัติในแง่จริยธรรมและให้ดำเนินการวิจัย ข้างต้นภายในโรงพยาบาลพระนครศรีอยุธยา ทั้งนี้โดยยึดตามเอกสารฉบับภาษาไทยเป็นหลัก

(นายสุรชัย โชคครรชิตไชย)
นายแพทย์เชี่ยวชาญ(ด้านเวชกรรม สาขาอายุรกรรม)
รองประธานคณะกรรมการจริยธรรมการทำวิจัยในคน

(นางกิติยา ประสานวงศ์)
นายแพทย์เชี่ยวชาญ(ด้านเวชกรรม สาขากุมารเวชกรรม)
ประธานคณะกรรมการจริยธรรมการทำวิจัยในคน

เอกสารรับรองโครงการวิจัยที่เกี่ยวกับการวิจัยในคน
โรงพยาบาลราชวิถี

รหัสโครงการวิจัยที่ 57033
เอกสารเลขที่ 033/2557

ชื่อโครงการ "ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย"

(ภาษาอังกฤษ) "Factors Influencing Adherence to Low Sodium Diet in Heart Failure Patients"

ชื่อหัวหน้าโครงการ นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา

ตำแหน่ง นักศึกษาปริญญาเอก

สังกัดหน่วยงาน คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

เอกสารที่รับรอง

1. โครงร่างการวิจัย ฉบับที่ 1 ลงวันที่ 27 กุมภาพันธ์ 2557
2. แบบสอบถาม, แบบประเมิน ฉบับที่ 1 ลงวันที่ 27 กุมภาพันธ์ 2557
3. เอกสารข้อมูลคำอธิบายสำหรับผู้เข้าร่วมในโครงการวิจัย ฉบับที่ 1 ลงวันที่ 27 กุมภาพันธ์ 2557
4. เอกสารแสดงความยินยอมเข้าร่วมในโครงการวิจัย ฉบับที่ 1 ลงวันที่ 27 กุมภาพันธ์ 2557

โครงการวิจัยได้ผ่านการพิจารณาและรับรองโดยคณะกรรมการจริยธรรมการวิจัยโรงพยาบาลราชวิถี เมื่อวันที่ 27 เดือน กุมภาพันธ์ พ.ศ. 2557 และจะรับรองโครงการการวิจัยเป็นระยะเวลา 2 ปี คือสิ้นสุดวันที่ 26 เดือน กุมภาพันธ์ พ.ศ. 2559

ลงนาม.....
(รศ.คลินิก นพ.อุดม ไกรฤทธิชัย)
ประธานคณะกรรมการวิจัยและจริยธรรมการวิจัย

ลงนาม.....
(นายแพทย์อุดม เชาวรินทร์)
ผู้อำนวยการโรงพยาบาลราชวิถี

ทั้งนี้ การรับรองนี้มีเงื่อนไขดังที่ระบุไว้ด้านหลังทุกข้อ (ดูด้านหลังของเอกสารรับรองโครงการวิจัย)

เลขที่ 035/2557

คณะกรรมการจริยธรรมเพื่อการวิจัยสถาบันโรคทรวงอก

กรมการแพทย์

กระทรวงสาธารณสุข

โครงการวิจัย : "ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย"

ผู้ดำเนินการวิจัย : นางสาวสินีนุช เสนีวงศ์ ณ อยุธยา นิสิตชั้นปริญญาดุษฎีบัณฑิต
คณะพยาบาลศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

สถานที่ทำการวิจัย : สถาบันโรคทรวงอก

เอกสารที่ได้รับการพิจารณามีดังนี้

1. หนังสือขออนุมัติดำเนินการวิจัยในสถาบันโรคทรวงอก (แบบฟอร์ม FM-CRC-01)
2. แบบสรุปย่อโครงการวิจัย (แบบฟอร์ม FM-CRC-02)
3. โครงร่างดุษฎีนิพนธ์

คณะกรรมการจริยธรรมเพื่อการวิจัยสถาบันโรคทรวงอก กรมการแพทย์ กระทรวงสาธารณสุข อนุมัติในแง่จริยธรรมให้ดำเนินการศึกษาวิจัยเรื่องข้างต้นได้

..... ประธานกรรมการ
(นายแพทย์ชูศักดิ์ เกษมศานติ์)

..... เลขานุการกรรมการ
(นายแพทย์เฉลียว พูลศิริปัญญา)

รับรองวันที่ : 19 มี.ค. 2557

วันหมดอายุ : 18 มี.ค. 2558

COA No. 177/2014

IRB No. 039/57

INSTITUTIONAL REVIEW BOARD

Faculty of Medicine, Chulalongkorn University

1873 Rama 4 Road, Patumwan, Bangkok 10330, Thailand, Tel 662-256-4493 ext 14, 15

Certificate of Approval

The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand, has approved the following study which is to be carried out in compliance with the International guidelines for human research protection as Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Study Title	: Factors influencing adherence to low sodium diet in heart failure patients.
Study Code	: -
Principal Investigator	: Miss Sineenut Senivong Na Ayudhaya
Affiliation of PI	: Faculty of Nursing, Chulalongkorn University.
Review Method	: Expedited
Continuing Report	: At least once annually or submit the final report if finished.
Document Reviewed	:

1. Protocol Version 2.0 Dated 26 February 2014
2. Protocol Synopsis Version 1.0 Dated 20 January 2014
3. Information sheet for research participant Version 2.0 Dated 26 February 2014
4. Informed Consent Form Version 2.0 Dated 26 February 2014
5. Curriculum Vitae
6. Research Tool Version 1.0 Dated 20 January 2014
7. Manual
8. Budget Version 1.0 Dated 20 January 2014

Signature:..... Signature:.....

(Emeritus Professor Tada Sueblinvong MD) (Assistant Professor Prapapan Rajatapiti MD, PhD)

Chairperson Member and Secretary

The Institutional Review Board Secretary The Institutional Review Board

Date of Approval : March 13, 2014

Approval Expire Date : March 12, 2015

Approval granted is subject to the following conditions: (see back of this Certificate)

APPENDIX C
INFORMED CONSENT FORM

หนังสือยินยอมโดยสมัครใจของผู้ถูกวิจัย (Informed Consent Form)

การวิจัยเรื่อง ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารที่มีโซเดียมต่ำในผู้ป่วยหัวใจวาย

วันที่ให้ความยินยอม วันที่ ..... เดือน ..... พ.ศ. .....

ก่อนที่ลงนามในใบยินยอมให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัย ถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย อันตรายหรืออาการที่อาจจะเกิดขึ้นจากการวิจัยหรือจากยาที่ใช้ รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียด และเข้าใจดีแล้ว

ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆ ที่ข้าพเจ้าสงสัยด้วยความเต็มใจ ไม่ปิดบัง ซ่อนเร้น จนข้าพเจ้าพอใจ ข้าพเจ้ามีสิทธิ์ที่จะบอกเลิกการเข้าร่วมโครงการวิจัยนี้เมื่อใดก็ได้ และเข้าร่วมโครงการวิจัยด้วยความสมัครใจ และการบอกเลิกการเข้าร่วมการวิจัย จะไม่มีผลต่อการรักษาโรคที่ข้าพเจ้าพึงได้รับต่อไป

ผู้วิจัยรับรองว่าจะเก็บข้อมูลเกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปของการสรุปผลการวิจัย หรือเปิดเผยเฉพาะต่อผู้มีหน้าที่เกี่ยวข้องกับการสนับสนุนและกำกับดูแลการวิจัย

ผู้วิจัยรับรองว่าหากเกิดอันตรายใดๆ จากการวิจัยดังกล่าว ข้าพเจ้าจะได้รับการรักษาแก้ไขภาวะที่เกิดขึ้นเหมือนกับผู้ป่วยโดยทั่วไปจากโรงพยาบาลตามมาตรฐานการรักษาที่ดีที่สุด โดยบุคคลที่รับผิดชอบเรื่องนี้ คือ นางสาว สินีนุช เสนีวงศ์ ณ อยุธยา ผู้รับผิดชอบโครงการวิจัย สามารถติดต่อได้ที่ 43/2 หมู่ 6 ต.บ้านใหม่ อ.ปากเกร็ด จ.นนทบุรี 11120 โทร 02-9809501 มือถือ 081-9225908 e-mail: s_mjuk@yahoo.com

ข้าพเจ้าได้อ่านข้อความข้างต้น และมีความเข้าใจดีทุกประการ และได้ลงนามในใบยินยอมนี้ด้วยความเต็มใจ

☐ ขอแสดงเจตนายินยอมเข้าร่วมการวิจัย

☐ ขอแสดงเจตนา<u>ไม่ยินยอม</u>เข้าร่วมการวิจัย

ลงนาม..... ผู้ยินยอม ลงนาม..... ผู้วิจัย

(.....) (.....)

วันที่ ..... วันที่ .....

ลงนาม.....พยาน

(.....)

วันที่ .....

ลงนาม.....พยาน

(.....)

วันที่ .....

APPENDIX D
LIST OF THE EXPERTS

LIST OF THE EXPERTS FOR CONTENT VALIDITY

1. Vice-Professor Ongkarn Raungratanaamporn, M.D.

   Perfect Heart Institute, Piyavate Hospital

2. Asst.Prof.Dr.Doungrut Wattanakitkrileart

   Faculty of Nursing, Mahidol University

3. Asst.Prof.Dr.Napaporn Wanitkun

   Faculty of Nursing, Mahidol University

4. Dr.Yothaka Pakapong

   Faculty of Nursing, Thammasat University

5. Dr. Apinya Siripitayakunkit

   Ramathibodi School of Nursing,

   Faculty of Medicine Ramathibodi Hospital, Mahidol University

6. Asst.Prof.Dr. Kusuma Khuwatsamrit

   Ramathibodi School of Nursing,

   Faculty of Medicine Ramathibodi Hospital, Mahidol University

7. Mrs.Ornvigan Chaimongkol

   APN, King Chulalongkorn Memorial Hospital

APPENDIX E
INSTRUMENTS

เครื่องมือวิจัย

ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย
FACTORS INFLUENCING ADHERENCE TO LOW-SODIUM DIET IN
HEART FAILURE PATIENTS

แบบวัดที่จะใช้ในการเก็บข้อมูลเพื่อการศึกษาวิจัยเรื่อง “ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรับประทานอาหารโซเดียมต่ำในผู้ป่วยหัวใจวาย” ประกอบด้วยแบบสอบถามจำนวน 3 ส่วน แบบบันทึก 1 ชุด และคู่มือคำแนะนำ จำนวน 1ชุด รวมทั้งสิ้น 5 ชุด ดังนี้

1. แบบสอบถามข้อมูลส่วนบุคคล
2. แบบประเมินทัศนคติ การคล้อยตามกลุ่มอ้างอิง การรับรู้ความสามารถในการควบคุมพฤติกรรมตนเอง ในการรับประทานอาหารโซเดียมต่ำ
3. แบบประเมินความตั้งใจในการรับประทานอาหารโซเดียมต่ำ
4. แบบบันทึกการรับประทานอาหาร 3 วัน
5. คู่มือคำแนะนำการบันทึกอาหารที่บริโภคในรอบ 24 ชั่วโมงสำหรับผู้ป่วยหัวใจวาย

ส่วนที่ 1 แบบสอบถามข้อมูลส่วนบุคคล

คำชี้แจง: โปรดเติมข้อความลงในช่องว่างหรือทำเครื่องหมาย ✓ ลงใน ( ) หน้าข้อความที่ตรงกับความเป็นจริง

1. อายุ.....ปี
2. เพศ ( ) ชาย ( ) หญิง
3. รายได้ของท่าน.....บาท/เดือน
4. ผู้ดูแลในครอบครัว
   ( ) มี ได้แก่
   - ( ) คู่สมรส(สามีหรือภรรยา)
   - ( ) พี่น้อง
   - ( ) บุตร
   - ( ) ญาติอื่นๆ
   - ( ) ผู้ดูแลจากศูนย์
   - ( ) อื่น ๆ โปรดระบุ.....

   ( ) ไม่มี
5. ระดับการศึกษาขั้นสูงสุด
   ( ) ประถมศึกษาหรือต่ำกว่า
   ( ) มัธยมศึกษา/ปวช.
   ( ) ปริญญาตรี/ปวส
   ( ) สูงกว่าปริญญาตรี
   ( ) อื่น ๆ ระบุ.....

ส่วนที่ 2 แบบประเมินทัศนคติ การคล้อยตามกลุ่มอ้างอิง การรับรู้ความสามารถในการควบคุมพฤติกรรมตนเองในการรับประทานอาหารเกลือต่ำของผู้ป่วยหัวใจวาย

ส่วนที่ 2.1 แบบประเมินทัศนคติ การคล้อยตามกลุ่มอ้างอิง

คำชี้แจง แบบสอบถามส่วนนี้มีวัตถุประสงค์เพื่อต้องการประเมินทัศนคติ และการคล้อยตามกลุ่มอ้างอิงในการรับประทานอาหารเกลือต่ำของผู้ป่วยหัวใจวาย ให้ผู้ตอบแบบสอบถามทำเครื่องหมาย ✓ ลงในช่องที่**ตรงกับความคิดเห็นของท่านมากที่สุด**

ข้อความ	เห็นด้วยมากที่สุด	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยมากที่สุด
1. การรับประทานอาหารที่มีเกลือต่ำ เป็นเรื่องสำคัญสำหรับฉัน					
2. การรับประทานอาหารที่มีเกลือต่ำจะช่วยป้องกันไม่ ให้มีน้ำสะสมในร่างกาย					
3.					
4.					
5.					
6.					
7. สามี/ภรรยาของฉันหรือสมาชิกครอบครัวคนอื่นๆ คิดว่าฉันควรรับประทานอาหารที่มีเกลือต่ำ					
8.					
9.					

ส่วนที่ 2.2 แบบประเมินการรับรู้ความสามารถในการควบคุมพฤติกรรมตนเอง

คำชี้แจง แบบสอบถามส่วนนี้มีวัตถุประสงค์เพื่อต้องการประเมินการรับรู้ความสามารถในการควบคุมพฤติกรรมตนเองของผู้ป่วยหัวใจวาย ให้ผู้ตอบแบบสอบถามทำเครื่องหมาย ✓ ลงในช่องที่**ตรงกับความคิดเห็นของท่านมากที่สุด**

ข้อความ	มากที่สุด	มาก	ไม่แน่ใจ	น้อย	น้อยที่สุด
ฉัน<u>ไม่สามารถ</u>รับประทานอาหารที่มีเกลือต่ำได้ เพราะ 10. ไม่เข้าใจหรือไม่รู้ว่าทำอย่างไร					
11. รสชาติของอาหารที่มีเกลือต่ำไม่อร่อย					
12.					
13.					
14.					
15.					
16.					

ส่วนที่ 3 แบบประเมินความตั้งใจในการรับประทานอาหารเกลือต่ำของผู้ป่วยหัวใจวาย

คำชี้แจง แบบสอบถามส่วนนี้มีวัตถุประสงค์เพื่อต้องการประเมินความตั้งใจในการรับประทานอาหารเกลือต่ำของผู้ป่วยหัวใจวาย โดยให้ผู้ตอบแบบสอบถามทำเครื่องหมาย ✓ ลงในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด

ข้อความ	เห็นด้วยมากที่สุด	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยมากที่สุด
1. ท่านตั้งใจรับประทานอาหารที่มีเกลือต่ำตามที่แพทย์ พยาบาลแนะนำ					
2.					
3.					

ขอขอบคุณที่ให้ความร่วมมือในการตอบแบบสอบถาม

แบบบันทึกการรับประทานอาหาร 3 วัน
(3-day food record)

ข้อแนะนำในการบันทึกรายการอาหารที่รับประทาน

1. แบบบันทึกการรับประทานอาหาร 3 วัน จะต้องครอบคลุมการรับประทานอาหารทั้งในวันธรรมดา และวันหยุดสุดสัปดาห์ ดังนั้น จึงใคร่ขอความร่วมมือให้บันทึกการรับประทานอาหารในวันธรรมดาเป็นเวลา 2 วัน และในวันหยุดเสาร์-อาทิตย์เป็นเวลา 1 วัน

2. บันทึกอาหารทุกชนิดรวมทั้งขนมและเครื่องดื่มที่รับประทานตลอดวัน เริ่มตั้งแต่เวลา 06.00-05.59 น. ของแต่ละวัน โดยบันทึกเฉพาะส่วนที่ท่านรับประทานเท่านั้น

3. บันทึกอาหารที่รับประทานทั้งที่บ้านและนอกบ้าน

4. กรุณาบันทึกอาหารทั้ง 3 วัน ตามขั้นตอนและคำแนะนำการบันทึกอาหารที่ระบุไว้ใน “คู่มือคำแนะนำการบันทึกอาหารที่บริโภคในรอบ 24 ชั่วโมงสำหรับผู้ป่วยโรคหัวใจวาย” ที่ท่านได้รับจากผู้วิจัย ทั้งนี้ท่านจะได้รับแบบบันทึกอาหารจำนวนทั้งหมด 3 ชุด

ขอขอบคุณที่ให้ความร่วมมือในการบันทึกข้อมูล

แบบบันทึกอาหารในรอบ 24 ชั่วโมงสำหรับผู้ป่วยโรคหัวใจวาย

วันที่ ☐ 1 ☐ 2 ☐ 3 ของการบันทึกอาหาร วันที่ .....เดือน.....ปีพ.ศ.....

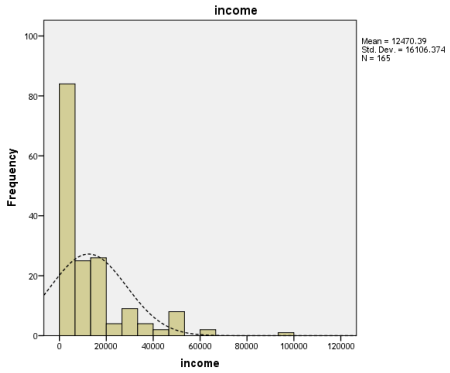
เป็นอาหารของวัน ☐ วันธรรมดา(จันทร์-ศุกร์) ☐ วันหยุด(เสาร์-อาทิตย์ หรือ วันหยุดนักขัตฤกษ์)

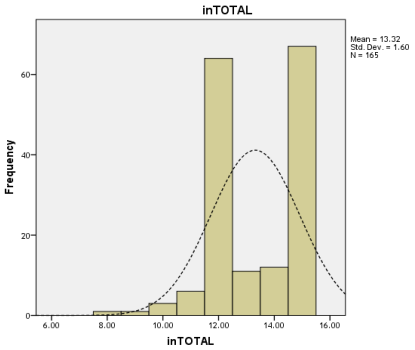
มื้อ/ เวลา/สถานที่	ชื่ออาหาร (จำนวน อาหาร, ราคา)	ส่วนประกอบของอาหาร (รายละเอียด เช่น ชนิด, การปรุง, ยี่ห้อ, รส, ลักษณะพิเศษ, ขนาด)	ปริมาณอาหาร		สำหรับผู้วิจัย	
			จำนวน ,น้ำหนัก	หน่วย	code	น.น.

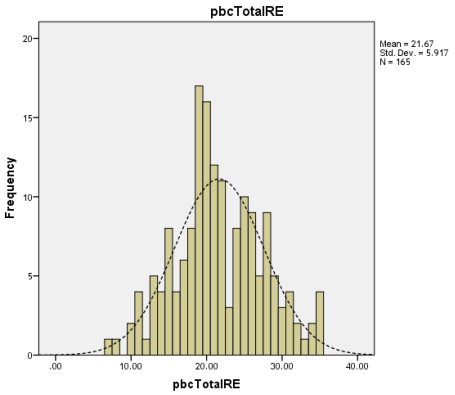
ขอขอบคุณที่ให้ความร่วมมือในการบันทึกข้อมูล

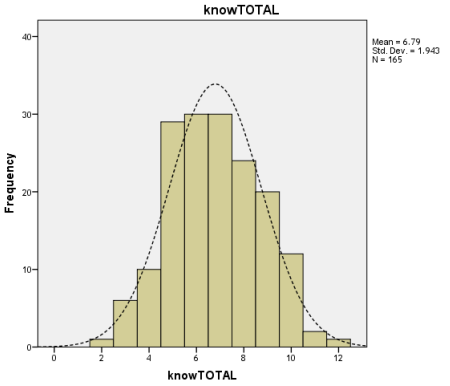
APPENDIX F
ASSUMPTION TESTING

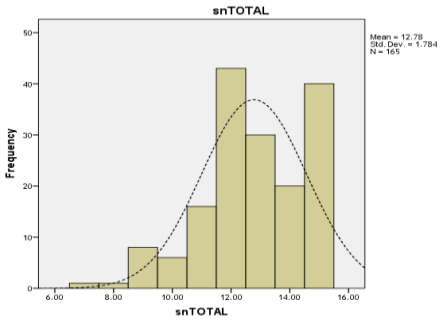
Normality

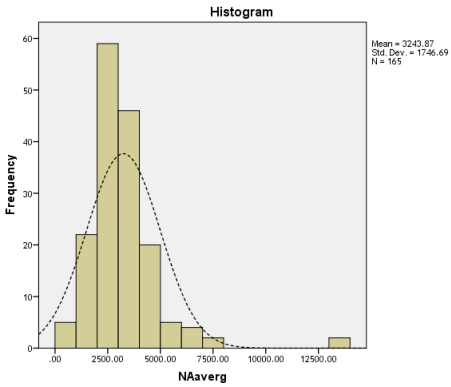

income
Mean = 12470.39
Std. Dev. = 16106.374
N = 165
Frequency
income


inTOTAL
Mean = 13.32
Std. Dev. = 1.60
N = 165
Frequency
inTOTAL

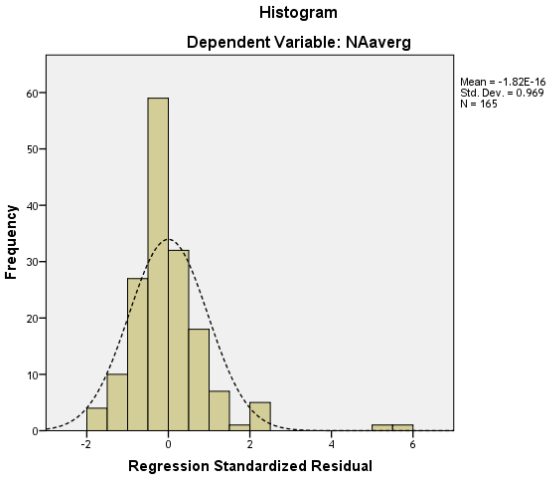

pbcTotalRE
Mean = 21.67
Std. Dev. = 5.917
N = 165
Frequency
pbcTotalRE

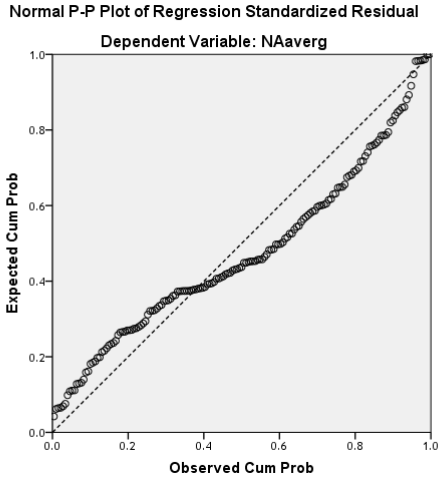

knowTOTAL
Mean = 6.79
Std. Dev. = 1.943
N = 165
Frequency
knowTOTAL

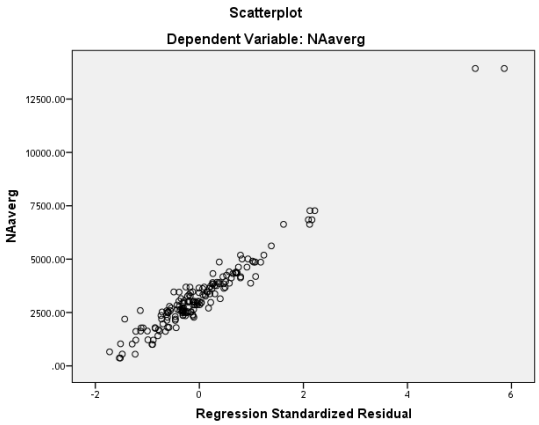

snTOTAL
Mean = 12.78
Std. Dev. = 1.784
N = 165
Frequency
snTOTAL


Histogram
Mean = 3243.87
Std. Dev. = 1746.69
N = 165
Frequency
NAaverg

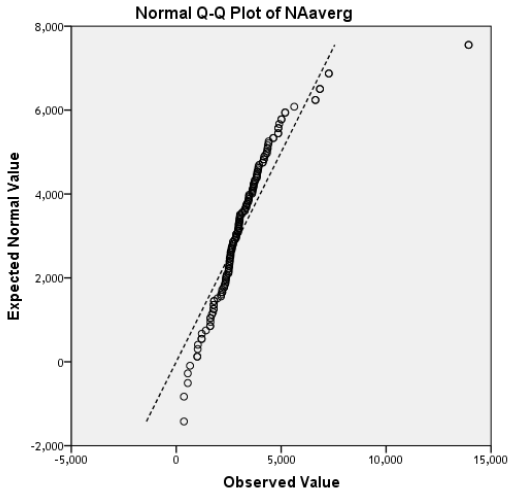
Linearity & homoscedasticity

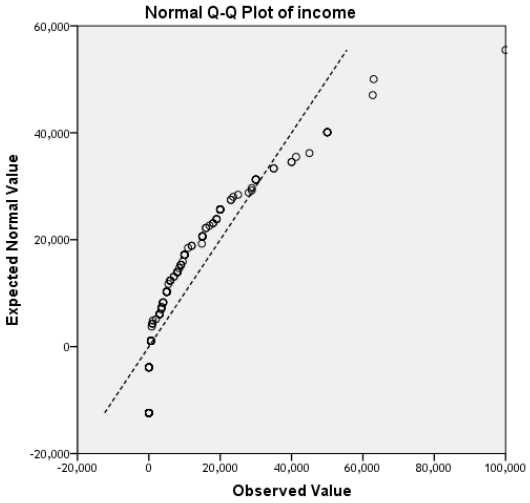




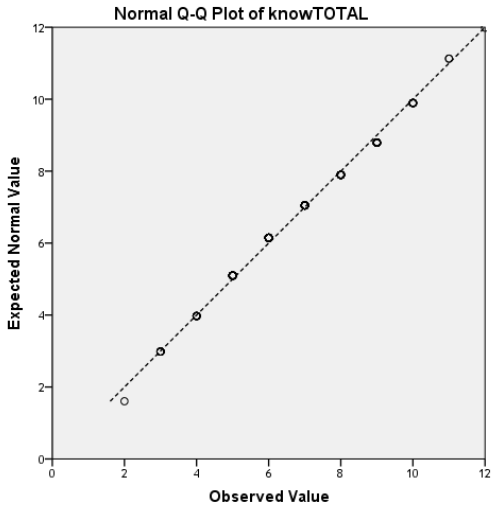


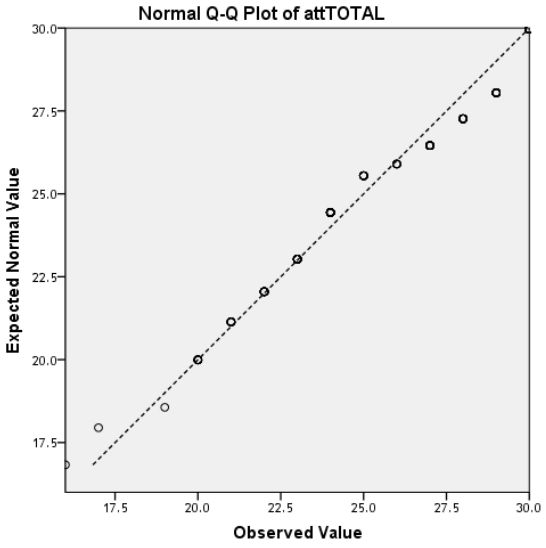
Q-Q Plot

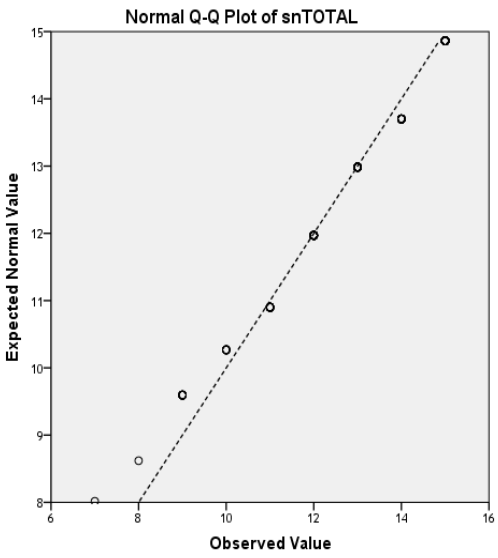

Normal Q-Q Plot of NAaverg
Expected Normal Value
Observed Value
8,000
6,000
4,000
2,000
0
-2,000
-5,000
0
5,000
10,000
15,000

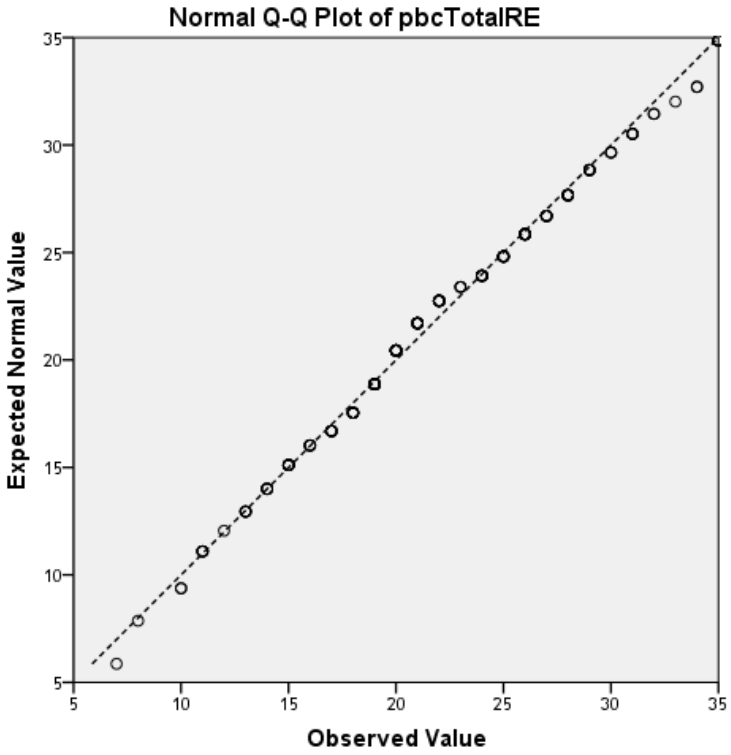

Normal Q-Q Plot of income
Expected Normal Value
Observed Value
60,000
40,000
20,000
0
-20,000
-20,000
0
20,000
40,000
60,000
80,000
100,000

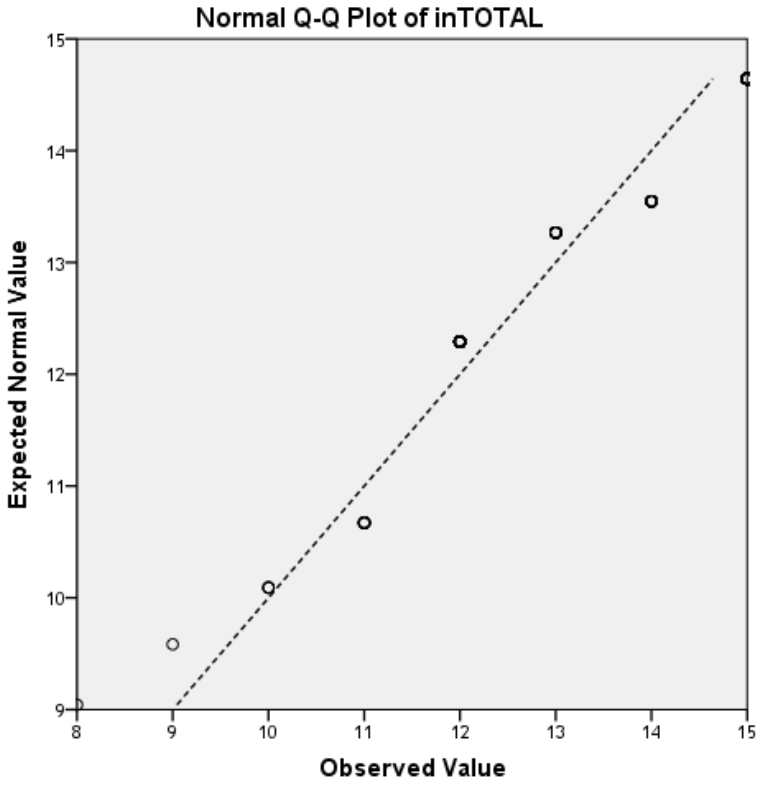

Normal Q-Q Plot of age
Expected Normal Value
Observed Value
100
80
60
40
20
0
0
20
40
60
80
100


Normal Q-Q Plot of knowTOTAL
Expected Normal Value
Observed Value
0
2
4
6
8
10
12


Normal Q-Q Plot of attTOTAL
Expected Normal Value
Observed Value
17.5
20.0
22.5
25.0
27.5
30.0


Normal Q-Q Plot of snTOTAL
Expected Normal Value
Observed Value
6
8
9
10
11
12
13
14
15
16


Normal Q-Q Plot of pbcTotalRE
Expected Normal Value
Observed Value
5
10
15
20
25
30
35


Normal Q-Q Plot of inTOTAL
Expected Normal Value
Observed Value
8
9
10
11
12
13
14
15

APPENDIX G

LISREL PRINT OUT

DATE: 7/23/2014

TIME: 16:44

L I S R E L 8.72

BY

Karl G. J”reskog & Dag S”rbom

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The following lines were read from file D:\Analysis\sirinut\Full model\model1.LPJ:

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 AC FI='D:\Analysis\sirinut\Full model\model1.acc'
 MO NX=16 NY=4 NK=3 NE=2 BE=FU GA=FI PS=SY TE=SY TD=SY
 LE
 Intention Adherence
 LK
 Attitude S.Norm PBC
 FI TE(4,4)
 VA 1 LY(4,2)

 FR LY(1,1) LY(2,1) LY(3,1) LX(1,1) LX(2,1) LX(3,1) LX(4,1) LX(5,1) LX(6,1)
 FR LX(7,2) LX(8,2) LX(9,2) LX(10,3) LX(11,3) LX(12,3) LX(13,3) LX(14,3)
LX(15,3)
 FR LX(16,3) BE(2,1) GA(1,3) GA(1,1) GA(1,2) GA(2,3)

 fr te 4 3 td 2 1 td 10 1 td 15 1 td 5 2 td 6 5 td 8 7 td 9 8 td 11 10 td 13
12
 fr td 16 10 td 16 14 td 6 4
 PD
 OU se tv ss sc ef rs

 TI
```

Number of Input Variables 20
Number of Y - Variables 4
Number of X - Variables 16
Number of ETA - Variables 2
Number of KSI - Variables 3
Number of Observations 165

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 TI
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Covariance Matrix

	inten1	inten2	inten3	NAavergR	atti1	atti2
inten1	0.28					
inten2	0.22	0.34				
inten3	0.23	0.31	0.42			
NAavergR	0.00	0.01	-0.03	0.25		
atti1	0.13	0.16	0.14	0.01	0.60	
atti2	0.09	0.09	0.10	0.06	0.28	0.51
atti3	0.12	0.15	0.12	0.04	0.28	0.24
atti4	0.08	0.12	0.14	0.00	0.27	0.25
atti5	0.14	0.16	0.17	0.02	0.25	0.20
atti6	0.09	0.12	0.11	0.02	0.18	0.17
sn7	0.13	0.16	0.15	0.05	0.23	0.23
sn8	0.11	0.09	0.11	-0.05	0.16	0.14
sn9	0.07	0.07	0.09	0.02	0.12	0.18
pbc10RE	0.11	0.11	0.09	0.00	0.20	0.16
pbc11RE	0.10	0.11	0.08	0.00	0.13	0.03
pbc12RE	0.05	0.07	0.08	0.01	0.03	0.04
pbc13RE	0.06	0.11	0.09	0.03	0.05	0.08
pbc14RE	0.04	0.06	0.00	0.06	0.00	0.04
pbc15RE	0.08	0.15	0.13	0.00	-0.10	0.08
pbc16RE	0.13	0.21	0.19	0.00	0.14	0.13

Covariance Matrix

	atti3	atti4	atti5	atti6	sn7	sn8
atti3	0.53					
atti4	0.28	0.71				
atti5	0.32	0.32	0.47			
atti6	0.21	0.32	0.30	0.41		
sn7	0.21	0.16	0.20	0.17	0.47	
sn8	0.17	0.18	0.17	0.17	0.16	0.46
sn9	0.11	0.18	0.12	0.17	0.25	0.29
pbc10RE	0.01	0.04	0.02	0.05	0.07	0.07
pbc11RE	0.02	-0.03	0.00	0.03	0.05	0.10
pbc12RE	-0.01	0.07	0.08	0.01	0.05	0.05
pbc13RE	0.05	0.09	0.11	0.09	0.08	0.09
pbc14RE	-0.03	0.00	0.04	0.08	0.05	0.03
pbc15RE	-0.03	0.06	0.04	0.09	0.08	0.07
pbc16RE	0.02	0.07	0.09	0.05	0.00	0.08

Covariance Matrix

	sn9	pbc10RE	pbc11RE	pbc12RE	pbc13RE	pbc14RE
sn9	0.84					
pbc10RE	0.01	1.25				
pbc11RE	-0.10	0.67	1.65			
pbc12RE	-0.05	0.49	0.60	1.51		
pbc13RE	-0.01	0.50	0.60	0.97	1.37	
pbc14RE	-0.07	0.46	0.67	0.79	0.90	1.48
pbc15RE	-0.10	0.42	0.80	0.55	0.69	0.77
pbc16RE	-0.04	0.57	0.47	0.34	0.41	0.30

Covariance Matrix

	pbc15RE	pbc16RE
pbc15RE	1.45	
pbc16RE	0.55	1.27

TI

Parameter Specifications

LAMBDA-Y

	Intentio	Adherenc
inten1	0	0
inten2	1	0
inten3	2	0
NAavergR	0	0

LAMBDA-X

	Attitude	S.Norm	PBC
atti1	3	0	0
atti2	4	0	0
atti3	5	0	0
atti4	6	0	0
atti5	7	0	0
atti6	8	0	0
sn7	0	9	0
sn8	0	10	0
sn9	0	11	0
pbc10RE	0	0	12
pbc11RE	0	0	13
pbc12RE	0	0	14
pbc13RE	0	0	15
pbc14RE	0	0	16
pbc15RE	0	0	17
pbc16RE	0	0	18

BETA

	Intentio	Adherenc
Intentio	0	0
Adherenc	19	0

GAMMA

	Attitude	S.Norm	PBC
Intentio	20	21	22
Adherenc	0	0	23

PHI

	Attitude	S.Norm	PBC
Attitude	0		
S.Norm	24	0	
PBC	25	26	0

PSI

Intentio	Adherenc
27	28

THETA-EPS

	inten1	inten2	inten3	NAavergR
inten1	29			
inten2	0	30		
inten3	0	0	31	
NAavergR	0	0	32	0

THETA-DELTA

	atti1	atti2	atti3	atti4	atti5	atti6
atti1	33					
atti2	34	35				
atti3	0	0	36			
atti4	0	0	0	37		
atti5	0	38	0	0	39	
atti6	0	0	0	40	41	42
sn7	0	0	0	0	0	0
sn8	0	0	0	0	0	0
sn9	0	0	0	0	0	0
pbc10RE	48	0	0	0	0	0
pbc11RE	0	0	0	0	0	0
pbc12RE	0	0	0	0	0	0
pbc13RE	0	0	0	0	0	0
pbc14RE	0	0	0	0	0	0
pbc15RE	56	0	0	0	0	0
pbc16RE	0	0	0	0	0	0

THETA-DELTA

	sn7	sn8	sn9	pbc10RE	pbc11RE	pbc12RE
sn7	43					
sn8	44	45				
sn9	0	46	47			
pbc10RE	0	0	0	49		
pbc11RE	0	0	0	50	51	
pbc12RE	0	0	0	0	0	52
pbc13RE	0	0	0	0	0	53
pbc14RE	0	0	0	0	0	0
pbc15RE	0	0	0	0	0	0
pbc16RE	0	0	0	58	0	0

THETA-DELTA

	pbc13RE	pbc14RE	pbc15RE	pbc16RE
pbc13RE	54			
pbc14RE	0	55		
pbc15RE	0	0	57	
pbc16RE	0	59	0	60

TI

Number of Iterations = 17

LISREL Estimates (Robust Maximum Likelihood)

LAMBDA-Y

	Intentio	Adherenc
inten1	0.40	- -
inten2	0.55	- -
	(0.06)	
	8.60	
inten3	0.56	- -
	(0.06)	
	8.84	
NAavergR	- -	1.00

LAMBDA-X

	Attitude	S.Norm	PBC
atti1	0.49	- -	- -
	(0.06)		
	8.02		
atti2	0.46	- -	- -
	(0.05)		
	8.78		
atti3	0.55	- -	- -
	(0.04)		
	12.18		
atti4	0.54	- -	- -
	(0.07)		
	8.04		
atti5	0.56	- -	- -
	(0.04)		
	14.12		
atti6	0.41	- -	- -
	(0.04)		
	10.32		
sn7	- -	0.66	- -
		(0.09)	
		7.24	
sn8	- -	0.50	- -
		(0.09)	
		5.55	
sn9	- -	0.38	- -
		(0.09)	
		4.34	
pbc10RE	- -	- -	0.54

			(0.09)
			6.09
pbc11RE	- -	- -	0.80
			(0.10)
			8.26
pbc12RE	- -	- -	0.73
			(0.11)
			6.83
pbc13RE	- -	- -	0.84
			(0.09)
			9.52
pbc14RE	- -	- -	0.93
			(0.08)
			11.03
pbc15RE	- -	- -	0.88
			(0.08)
			11.53
pbc16RE	- -	- -	0.59
			(0.09)
			6.31

BETA

	Intentio	Adherenc
Intentio	- -	- -
Adherenc	0.02	- -
	(0.04)	
	0.41	

GAMMA

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
	(0.10)	(0.10)	(0.07)
	3.79	1.56	2.52
Adherenc	- -	- -	0.01
			(0.04)
			0.26

Covariance Matrix of ETA and KSI

	Intentio	Adherenc	Attitude	S.Norm	PBC
Intentio	1.00				
Adherenc	0.02	0.25			
Attitude	0.49	0.01	1.00		
S.Norm	0.41	0.01	0.60	1.00	
PBC	0.25	0.02	0.11	0.15	1.00

PHI

	Attitude	S.Norm	PBC
Attitude	1.00		
S.Norm	0.60	1.00	
	(0.10)		
	6.21		
PBC	0.11	0.15	1.00
	(0.10)	(0.08)	
	1.07	1.86	

PSI
Note: This matrix is diagonal.

Intentio	Adherenc
0.70	0.25
(0.13)	(0.00)
5.41	100.40

Squared Multiple Correlations for Structural Equations

Intentio	Adherenc
0.30	0.00

Squared Multiple Correlations for Reduced Form

Intentio	Adherenc
0.30	0.00

Reduced Form

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
	(0.10)	(0.10)	(0.07)
	3.79	1.56	2.52
Adherenc	0.01	0.00	0.01
	(0.02)	(0.01)	(0.04)
	0.41	0.39	0.35

THETA-EPS

	inten1	inten2	inten3	NAavergR
inten1	0.11			
	(0.02)			
	5.32			
inten2	- -	0.04		
		(0.02)		
		2.03		
inten3	- -	- -	0.11	
			(0.03)	
			3.09	

NAavergR	- -	- -	-0.04	- -
			(0.01)	
			-2.86	

Squared Multiple Correlations for Y - Variables

inten1	inten2	inten3	NAavergR
0.59	0.88	0.75	1.00

THETA-DELTA

	atti1	atti2	atti3	atti4	atti5	atti6
atti1	0.35					
	(0.09)					
	3.79					
atti2	0.04	0.30				
	(0.06)	(0.07)				
	0.73	4.64				
atti3	- -	- -	0.23			
			(0.04)			
			5.37			
atti4	- -	- -	- -	0.42		
				(0.07)		
				5.71		
atti5	- -	-0.05	- -	- -	0.16	
		(0.02)			(0.04)	
		-2.11			4.41	
atti6	- -	- -	- -	0.09	0.06	0.23
				(0.04)	(0.03)	(0.04)
				2.34	2.51	6.33
sn7	- -	- -	- -	- -	- -	- -
sn8	- -	- -	- -	- -	- -	- -
sn9	- -	- -	- -	- -	- -	- -
pbc10RE	0.09	- -	- -	- -	- -	- -
	(0.05)					
	1.72					
pbc11RE	- -	- -	- -	- -	- -	- -
pbc12RE	- -	- -	- -	- -	- -	- -
pbc13RE	- -	- -	- -	- -	- -	- -
pbc14RE	- -	- -	- -	- -	- -	- -
pbc15RE	-0.15	- -	- -	- -	- -	- -
	(0.05)					
	-2.83					
pbc16RE	- -	- -	- -	- -	- -	- -

THETA-DELTA

	sn7	sn8	sn9	pbc10RE	pbc11RE	pbc12RE
sn7	0.04 (0.11) 0.35					
sn8	-0.17 (0.09) -1.98	0.21 (0.12) 1.77				
sn9	- -	0.10 (0.09) 1.13	0.69 (0.12) 5.82			
pbc10RE	- -	- -	- -	0.94 (0.11) 8.82		
pbc11RE	- -	- -	- -	0.21 (0.08) 2.65	1.02 (0.16) 6.56	
pbc12RE	- -	- -	- -	- -	- -	0.98 (0.15) 6.45
pbc13RE	- -	- -	- -	- -	- -	0.37 (0.11) 3.21
pbc14RE	- -	- -	- -	- -	- -	- -
pbc15RE	- -	- -	- -	- -	- -	- -
pbc16RE	- -	- -	- -	0.22 (0.09) 2.38	- -	- -

THETA-DELTA

	pbc13RE	pbc14RE	pbc15RE	pbc16RE
pbc13RE	0.67 (0.12) 5.57			
pbc14RE	- -	0.62 (0.12) 4.94		
pbc15RE	- -	- -	0.70 (0.10) 7.32	
pbc16RE	- -	-0.24 (0.08) -3.12	- -	0.92 (0.13) 7.06

Squared Multiple Correlations for X - Variables

atti1	atti2	atti3	atti4	atti5	atti6
0.40	0.41	0.57	0.41	0.67	0.42

Squared Multiple Correlations for X - Variables

sn7	sn8	sn9	pbc10RE	pbc11RE	pbc12RE
0.92	0.54	0.18	0.24	0.38	0.35

Squared Multiple Correlations for X - Variables

pbc13RE	pbc14RE	pbc15RE	pbc16RE
0.51	0.58	0.53	0.27

Goodness of Fit Statistics

Degrees of Freedom = 150
Minimum Fit Function Chi-Square = 172.70 (P = 0.099)
Normal Theory Weighted Least Squares Chi-Square = 164.96 (P = 0.19)
Satorra-Bentler Scaled Chi-Square = 147.40 (P = 0.54)
Chi-Square Corrected for Non-Normality = 3921.52 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 0.0
90 Percent Confidence Interval for NCP = (0.0 ; 29.71)

Minimum Fit Function Value = 1.05
Population Discrepancy Function Value (F0) = 0.0
90 Percent Confidence Interval for F0 = (0.0 ; 0.18)
Root Mean Square Error of Approximation (RMSEA) = 0.0
90 Percent Confidence Interval for RMSEA = (0.0 ; 0.035)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.98

Expected Cross-Validation Index (ECVI) = 1.65
90 Percent Confidence Interval for ECVI = (1.65 ; 1.83)
ECVI for Saturated Model = 2.56
ECVI for Independence Model = 15.27

Chi-Square for Independence Model with 190 Degrees of Freedom = 2464.85
Independence AIC = 2504.85
Model AIC = 284.96
Saturated AIC = 420.00
Independence CAIC = 2586.97
Model CAIC = 531.32
Saturated CAIC = 1282.25

Normed Fit Index (NFI) = 0.94
Non-Normed Fit Index (NNFI) = 1.00
Parsimony Normed Fit Index (PNFI) = 0.74
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00
Relative Fit Index (RFI) = 0.92

Critical N (CN) = 215.97

Root Mean Square Residual (RMR) = 0.044
Standardized RMR = 0.055
Goodness of Fit Index (GFI) = 0.91
Adjusted Goodness of Fit Index (AGFI) = 0.87
Parsimony Goodness of Fit Index (PGFI) = 0.65

TI

Fitted Covariance Matrix

	inten1	inten2	inten3	NAavergR	atti1	atti2
inten1	0.28					
inten2	0.22	0.34				
inten3	0.23	0.31	0.42			
NAavergR	0.01	0.01	-0.03	0.25		
atti1	0.10	0.13	0.13	0.00	0.59	
atti2	0.09	0.12	0.13	0.00	0.26	0.51
atti3	0.11	0.15	0.15	0.01	0.27	0.25
atti4	0.11	0.15	0.15	0.01	0.26	0.24
atti5	0.11	0.15	0.16	0.01	0.27	0.20
atti6	0.08	0.11	0.11	0.00	0.20	0.19
sn7	0.11	0.15	0.15	0.01	0.19	0.18
sn8	0.08	0.11	0.12	0.00	0.15	0.14
sn9	0.06	0.09	0.09	0.00	0.11	0.11
pbc10RE	0.05	0.07	0.08	0.01	0.11	0.03
pbc11RE	0.08	0.11	0.11	0.01	0.04	0.04
pbc12RE	0.07	0.10	0.10	0.01	0.04	0.04
pbc13RE	0.08	0.11	0.12	0.01	0.04	0.04
pbc14RE	0.09	0.13	0.13	0.01	0.05	0.04
pbc15RE	0.09	0.12	0.12	0.01	-0.11	0.04
pbc16RE	0.06	0.08	0.08	0.01	0.03	0.03

Fitted Covariance Matrix

	atti3	atti4	atti5	atti6	sn7	sn8
atti3	0.53					
atti4	0.29	0.71				
atti5	0.31	0.30	0.47			
atti6	0.23	0.31	0.30	0.40		
sn7	0.22	0.21	0.22	0.16	0.47	
sn8	0.17	0.16	0.17	0.12	0.16	0.46
sn9	0.13	0.12	0.13	0.10	0.25	0.29
pbc10RE	0.03	0.03	0.03	0.02	0.05	0.04
pbc11RE	0.05	0.05	0.05	0.03	0.08	0.06
pbc12RE	0.04	0.04	0.04	0.03	0.07	0.05
pbc13RE	0.05	0.05	0.05	0.04	0.08	0.06
pbc14RE	0.05	0.05	0.06	0.04	0.09	0.07
pbc15RE	0.05	0.05	0.05	0.04	0.09	0.06
pbc16RE	0.03	0.03	0.03	0.03	0.06	0.04

Fitted Covariance Matrix

	sn9	pbc10RE	pbc11RE	pbc12RE	pbc13RE	pbc14RE
sn9	0.84					
pbc10RE	0.03	1.23				
pbc11RE	0.05	0.64	1.65			
pbc12RE	0.04	0.40	0.58	1.51		
pbc13RE	0.05	0.45	0.67	0.97	1.37	
pbc14RE	0.05	0.50	0.74	0.68	0.78	1.48
pbc15RE	0.05	0.48	0.70	0.64	0.74	0.82
pbc16RE	0.03	0.54	0.47	0.43	0.49	0.30

Fitted Covariance Matrix

	pbc15RE	pbc16RE
pbc15RE	1.47	
pbc16RE	0.52	1.27

Fitted Residuals

	inten1	inten2	inten3	NAavergR	atti1	atti2
inten1	0.00					
inten2	0.00	0.00				
inten3	0.00	0.00	0.00			
NAavergR	-0.01	0.00	0.00	0.00		
atti1	0.03	0.03	0.00	0.01	0.01	
atti2	0.00	-0.03	-0.03	0.05	0.02	0.00
atti3	0.01	0.00	-0.03	0.03	0.01	-0.01
atti4	-0.03	-0.02	-0.01	0.00	0.01	0.01
atti5	0.03	0.01	0.01	0.02	-0.02	-0.01
atti6	0.01	0.01	0.00	0.01	-0.02	-0.01
sn7	0.02	0.01	0.00	0.04	0.04	0.05
sn8	0.03	-0.03	0.00	-0.05	0.01	0.00
sn9	0.01	-0.02	0.01	0.02	0.01	0.07
pbc10RE	0.05	0.04	0.02	-0.01	0.09	0.13
pbc11RE	0.02	0.00	-0.03	-0.01	0.09	0.00
pbc12RE	-0.02	-0.03	-0.02	-0.01	-0.01	0.01
pbc13RE	-0.02	0.00	-0.03	0.02	0.00	0.04
pbc14RE	-0.05	-0.07	-0.13	0.05	-0.05	0.00
pbc15RE	0.00	0.03	0.01	-0.01	0.01	0.04
pbc16RE	0.07	0.13	0.11	-0.01	0.11	0.10

Fitted Residuals

	atti3	atti4	atti5	atti6	sn7	sn8
atti3	0.00					
atti4	-0.02	0.00				
atti5	0.01	0.02	0.00			
atti6	-0.01	0.01	0.01	0.00		
sn7	-0.01	-0.05	-0.02	0.01	0.00	
sn8	0.00	0.01	0.00	0.04	0.00	0.00
sn9	-0.02	0.05	-0.01	0.07	0.00	0.00
pbc10RE	-0.02	0.01	-0.01	0.02	0.01	0.03
pbc11RE	-0.02	-0.08	-0.05	0.00	-0.02	0.05
pbc12RE	-0.05	0.03	0.03	-0.02	-0.02	-0.01
pbc13RE	0.00	0.05	0.06	0.05	0.00	0.03
pbc14RE	-0.08	-0.05	-0.02	0.04	-0.04	-0.04
pbc15RE	-0.08	0.01	-0.01	0.05	0.00	0.01
pbc16RE	-0.01	0.04	0.05	0.02	-0.05	0.04

Fitted Residuals

	sn9	pbc10RE	pbc11RE	pbc12RE	pbc13RE	pbc14RE
sn9	0.00					
pbc10RE	-0.02	0.02				
pbc11RE	-0.14	0.03	0.00			
pbc12RE	-0.09	0.09	0.02	0.00		
pbc13RE	-0.06	0.05	-0.07	0.00	0.00	
pbc14RE	-0.13	-0.04	-0.07	0.11	0.12	0.00
pbc15RE	-0.15	-0.05	0.10	-0.09	-0.05	-0.04
pbc16RE	-0.08	0.03	0.00	-0.09	-0.09	-0.01

Fitted Residuals

	pbc15RE	pbc16RE
pbc15RE	-0.01	
pbc16RE	0.04	0.00

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =   -0.15
  Median Fitted Residual =    0.00
 Largest Fitted Residual =    0.13
```

Stemleaf Plot

```
-14|24
-12|76
-10|
- 8|39972
- 6|8779982
- 4|533221076541
- 2|96222097554333221
- 0|99988877664433222211109977766654444333331111100000000000000000000000
  0|11123334445566666677778890000122223344455789
  2|00122345678889033456779
  4|00001455600112444
  6|0013
  8|80189
 10|8348
 12|80
```

Standardized Residuals

	inten1	inten2	inten3	NAavergR	atti1	atti2
inten1	- -					
inten2	- -	0.00				
inten3	- -	0.06	0.00			
NAavergR	-0.79	0.98	- -	- -		
atti1	1.73	1.43	0.19	0.27	0.12	
atti2	-0.15	-1.94	-1.11	1.96	0.47	0.05
atti3	0.95	-0.21	-2.30	1.32	0.27	-0.25
atti4	-1.27	-0.66	-0.36	-0.13	0.09	0.26
atti5	2.19	0.52	0.67	0.64	- -	- -
atti6	0.81	0.42	-0.13	0.60	-0.83	-2.64
sn7	2.77	- -	-0.05	1.68	1.45	1.45
sn8	1.83	-2.93	-0.16	-2.17	0.35	0.13
sn9	0.35	-0.73	0.19	0.44	0.17	1.35
pbc10RE	1.44	1.10	0.44	-0.18	1.57	1.98
pbc11RE	0.45	0.09	-0.68	-0.30	1.44	-0.06
pbc12RE	-0.46	-0.66	-0.56	-0.17	-0.18	0.10
pbc13RE	-0.70	-0.17	-0.79	0.67	0.07	0.75
pbc14RE	-1.58	-2.42	-3.68	1.86	-0.80	-0.01
pbc15RE	-0.13	1.09	0.27	-0.41	0.14	0.63
pbc16RE	1.99	2.85	2.05	-0.39	1.73	1.59

Standardized Residuals

	atti3	atti4	atti5	atti6	sn7	sn8
atti3	0.00					
atti4	- -	- -				
atti5	- -	- -	- -			
atti6	- -	- -	- -	- -		
sn7	- -	-1.80	- -	0.34	- -	
sn8	0.02	0.48	- -	1.84	0.00	0.00
sn9	-0.69	1.09	-0.67	2.07	0.00	0.00
pbc10RE	-0.31	0.14	-0.24	0.48	0.26	0.55
pbc11RE	-0.36	-0.97	-0.75	-0.07	-0.44	0.74
pbc12RE	-0.85	0.36	0.60	-0.36	-0.42	-0.15
pbc13RE	-0.02	0.69	1.27	1.10	0.00	0.53
pbc14RE	-1.84	-0.77	-0.35	0.87	-0.99	-0.81
pbc15RE	-1.56	0.17	-0.21	0.93	-0.06	0.10
pbc16RE	-0.23	0.50	0.94	0.45	-1.09	0.64

Standardized Residuals

	sn9	pbc10RE	pbc11RE	pbc12RE	pbc13RE	pbc14RE
sn9	0.00					
pbc10RE	-0.22	- -				
pbc11RE	-1.49	- -	- -			
pbc12RE	-1.02	1.37	0.24	- -		
pbc13RE	-0.72	0.89	-1.11	- -	- -	
pbc14RE	-1.34	-0.84	-2.73	2.13	4.48	- -
pbc15RE	-1.77	-0.86	- -	-1.49	-1.03	- -
pbc16RE	-0.88	- -	-0.02	-1.30	-1.95	-0.12

Standardized Residuals

	pbc15RE	pbc16RE
pbc15RE	- -	
pbc16RE	0.91	- -

Summary Statistics for Standardized Residuals

Smallest Standardized Residual = -3.68
Median Standardized Residual = 0.00
Largest Standardized Residual = 4.48

Stemleaf Plot

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- 3|7
- 3|
- 2|976
- 2|432
- 1|998886655
- 1|3331110000
- 0|999888888877777777765
-
0|4444444333222222222211111111110000000000000000000000000000000000000000+0
6
  0|11111111112222233333333444444
  0|55555555666667777889999999
  1|0111133344444
  1|566777889
  2|0001112
  2|89
  3|
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  3|
  4|
  4|5
 Largest Negative Standardized Residuals
 Residual for    atti6 and    atti2  -2.64
 Residual for      sn8 and   inten2  -2.93
 Residual for  pbc14RE and   inten3  -3.68
 Residual for  pbc14RE and  pbc11RE  -2.73
 Largest Positive Standardized Residuals
 Residual for      sn7 and   inten1   2.77
 Residual for  pbc14RE and  pbc13RE   4.48
 Residual for  pbc16RE and   inten2   2.85

 TI
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Qplot of Standardized Residuals

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Standardized Residuals

TI

Standardized Solution

LAMBDA-Y

	Intentio	Adherenc
inten1	0.40	- -
inten2	0.55	- -
inten3	0.56	- -
NAavergR	- -	0.50

LAMBDA-X

	Attitude	S.Norm	PBC
atti1	0.49	- -	- -
atti2	0.46	- -	- -
atti3	0.55	- -	- -
atti4	0.54	- -	- -
atti5	0.56	- -	- -
atti6	0.41	- -	- -
sn7	- -	0.66	- -
sn8	- -	0.50	- -
sn9	- -	0.38	- -
pbc10RE	- -	- -	0.54
pbc11RE	- -	- -	0.80
pbc12RE	- -	- -	0.73
pbc13RE	- -	- -	0.84
pbc14RE	- -	- -	0.93
pbc15RE	- -	- -	0.88
pbc16RE	- -	- -	0.59

BETA

	Intentio	Adherenc
Intentio	- -	- -
Adherenc	0.03	- -

GAMMA

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
Adherenc	- -	- -	0.02

Correlation Matrix of ETA and KSI

	Intentio	Adherenc	Attitude	S.Norm	PBC
Intentio	1.00				
Adherenc	0.04	1.00			
Attitude	0.49	0.02	1.00		
S.Norm	0.41	0.02	0.60	1.00	
PBC	0.25	0.03	0.11	0.15	1.00

PSI

Note: This matrix is diagonal.

	Intentio	Adherenc
	0.70	1.00

Regression Matrix ETA on KSI (Standardized)

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
Adherenc	0.01	0.01	0.03

TI

Completely Standardized Solution

LAMBDA-Y

	Intentio	Adherenc
inten1	0.76	- -
inten2	0.94	- -
inten3	0.87	- -
NAavergR	- -	1.00

LAMBDA-X

	Attitude	S.Norm	PBC
atti1	0.63	- -	- -
atti2	0.64	- -	- -
atti3	0.75	- -	- -
atti4	0.64	- -	- -
atti5	0.82	- -	- -
atti6	0.65	- -	- -
sn7	- -	0.96	- -
sn8	- -	0.73	- -
sn9	- -	0.42	- -
pbc10RE	- -	- -	0.49
pbc11RE	- -	- -	0.62
pbc12RE	- -	- -	0.59
pbc13RE	- -	- -	0.72
pbc14RE	- -	- -	0.76
pbc15RE	- -	- -	0.73
pbc16RE	- -	- -	0.52

BETA

	Intentio	Adherenc
Intentio	- -	- -
Adherenc	0.03	- -

GAMMA

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
Adherenc	- -	- -	0.02

Correlation Matrix of ETA and KSI

	Intentio	Adherenc	Attitude	S.Norm	PBC
Intentio	1.00				

Adherenc	0.04	1.00			
Attitude	0.49	0.02	1.00		
S.Norm	0.41	0.02	0.60	1.00	
PBC	0.25	0.03	0.11	0.15	1.00

PSI
Note: This matrix is diagonal.

Intentio	Adherenc
0.70	1.00

THETA-EPS

	inten1	inten2	inten3	NAavergR
inten1	0.41			
inten2	- -	0.12		
inten3	- -	- -	0.25	
NAavergR	- -	- -	-0.13	- -

THETA-DELTA

	atti1	atti2	atti3	atti4	atti5	atti6
atti1	0.60					
atti2	0.07	0.59				
atti3	- -	- -	0.43			
atti4	- -	- -	- -	0.59		
atti5	- -	-0.10	- -	- -	0.33	
atti6	- -	- -	- -	0.16	0.15	0.58
sn7	- -	- -	- -	- -	- -	- -
sn8	- -	- -	- -	- -	- -	- -
sn9	- -	- -	- -	- -	- -	- -
pbc10RE	0.10	- -	- -	- -	- -	- -
pbc11RE	- -	- -	- -	- -	- -	- -
pbc12RE	- -	- -	- -	- -	- -	- -
pbc13RE	- -	- -	- -	- -	- -	- -
pbc14RE	- -	- -	- -	- -	- -	- -
pbc15RE	-0.17	- -	- -	- -	- -	- -
pbc16RE	- -	- -	- -	- -	- -	- -

THETA-DELTA

	sn7	sn8	sn9	pbc10RE	pbc11RE	pbc12RE
sn7	0.08					
sn8	-0.36	0.46				
sn9	- -	0.16	0.82			
pbc10RE	- -	- -	- -	0.76		
pbc11RE	- -	- -	- -	0.15	0.62	
pbc12RE	- -	- -	- -	- -	- -	0.65
pbc13RE	- -	- -	- -	- -	- -	0.25
pbc14RE	- -	- -	- -	- -	- -	- -
pbc15RE	- -	- -	- -	- -	- -	- -
pbc16RE	- -	- -	- -	0.18	- -	- -

THETA-DELTA

	pbc13RE	pbc14RE	pbc15RE	pbc16RE
pbc13RE	0.49			
pbc14RE	- -	0.42		
pbc15RE	- -	- -	0.47	
pbc16RE	- -	-0.18	- -	0.73

Regression Matrix ETA on KSI (Standardized)

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
Adherenc	0.01	0.01	0.03

TI

Total and Indirect Effects

Total Effects of KSI on ETA

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
	(0.10)	(0.10)	(0.07)
	3.79	1.56	2.52
Adherenc	0.01	0.00	0.01
	(0.02)	(0.01)	(0.04)
	0.41	0.39	0.35

Indirect Effects of KSI on ETA

	Attitude	S.Norm	PBC
Intentio	- -	- -	- -
Adherenc	0.01	0.00	0.00
	(0.02)	(0.01)	(0.01)
	0.41	0.39	0.41

Total Effects of ETA on ETA

	Intentio	Adherenc
Intentio	- -	- -
Adherenc	0.02	- -
	(0.04)	
	0.41	

Largest Eigenvalue of B*B' (Stability Index) is 0.000

Total Effects of ETA on Y

	Intentio	Adherenc
inten1	0.40	- -
inten2	0.55	- -

	(0.06)	
	8.60	
inten3	0.56	- -
	(0.06)	
	8.84	
NAavergR	0.02	1.00
	(0.04)	
	0.41	

Indirect Effects of ETA on Y

	Intentio	Adherenc
inten1	- -	- -
inten2	- -	- -
inten3	- -	- -
NAavergR	0.02	- -
	(0.04)	
	0.41	

Total Effects of KSI on Y

	Attitude	S.Norm	PBC
inten1	0.15	0.06	0.07
	(0.04)	(0.04)	(0.03)
	3.79	1.56	2.52
inten2	0.21	0.09	0.10
	(0.06)	(0.05)	(0.04)
	3.67	1.60	2.44
inten3	0.21	0.09	0.10
	(0.06)	(0.05)	(0.04)
	3.53	1.61	2.48
NAavergR	0.01	0.00	0.01
	(0.02)	(0.01)	(0.04)
	0.41	0.39	0.35

TI

Standardized Total and Indirect Effects

Standardized Total Effects of KSI on ETA

	Attitude	S.Norm	PBC
Intentio	0.38	0.16	0.18
Adherenc	0.01	0.01	0.03

Standardized Indirect Effects of KSI on ETA

	Attitude	S.Norm	PBC
Intentio	- -	- -	- -

Adherenc	0.01	0.01	0.01

Standardized Total Effects of ETA on ETA

	Intentio	Adherenc
Intentio	- -	- -
Adherenc	0.03	- -

Standardized Total Effects of ETA on Y

	Intentio	Adherenc
inten1	0.40	- -
inten2	0.55	- -
inten3	0.56	- -
NAavergR	0.02	0.50

Completely Standardized Total Effects of ETA on Y

	Intentio	Adherenc
inten1	0.76	- -
inten2	0.94	- -
inten3	0.87	- -
NAavergR	0.03	1.00

Standardized Indirect Effects of ETA on Y

	Intentio	Adherenc
inten1	- -	- -
inten2	- -	- -
inten3	- -	- -
NAavergR	0.02	- -

Completely Standardized Indirect Effects of ETA on Y

	Intentio	Adherenc
inten1	- -	- -
inten2	- -	- -
inten3	- -	- -
NAavergR	0.03	- -

Standardized Total Effects of KSI on Y

	Attitude	S.Norm	PBC
inten1	0.15	0.06	0.07
inten2	0.21	0.09	0.10
inten3	0.21	0.09	0.10
NAavergR	0.01	0.00	0.01

Completely Standardized Total Effects of KSI on Y

	Attitude	S.Norm	PBC
inten1	0.29	0.12	0.14
inten2	0.36	0.15	0.17
inten3	0.33	0.13	0.16
NAavergR	0.01	0.01	0.03

Time used: 1.872 Seconds

VITA

Sineenut Senivong Na Ayuthaya was born in 1969. She received a Bachelor of Nursing from Faculty of Nursing, Mahidol University in 1991. Then she got a Master of Education (Population Education) from Faculty of Socialty&Humunities, Mahidol University in 2002 and Master of Nursing Science(Adult Nursing) from Faculty of Nursing, Chulalongkorn University in 2004. In addition, she've got the Certificate of Cardiovascular Thoracic Nursing, Faculty of Nursing, Mahidol University in 2000. Sineenut had 6 year of clinical experience in acute and chronic care nursing and more than 10 years of teaching as a nursing instructor in adult nursing (CVT nursing) area at Boromarajonani College of Nursing, Chang Wat Nonthaburi, Thailand.