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Factors Influencing Blood Pressure among Rural Adults with Hypertension in China

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Factors Influencing Blood Pressure among Rural Adults with Hypertension in China

by

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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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ABBREVIATIONS

BMI	Body Mass Index
BP	Blood Pressure
SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure
SRM	Self-Regulation Model
IP	Illness Perception
IPQ	Illness Perception Questionnaires
IPQ-R	Illness Perception Questionnaire-Revised
IR	Illness Representation
CIPQ-R	Chinese Illness Perception-Revised
MAI	Medication Adherence Inventory
IASM	Inventory of Adherence to Self-Management

ABSTRACT OF THE DISSERTATION

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By

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The low rate of hypertension control in China has caught the attention of health providers. To achieve better outcomes, providers need to know what factors are significantly predictive of hypertension control. Researchers have rarely studied illness perception in China although it is one of the predictors for illness outcomes often studied in other countries. The purpose of this study was to examine the relationship among demographic and health-related characteristics, illness perception, adherence to medication and to self-management, and blood pressure in a sample of rural adults with hypertension in the Zhejiang Province of China. Leventhal's Self-Regulation Model guided this cross-sectional, descriptive, correlational study. One hundred sixty-three adults with hypertension in two villages in Zhejiang province participated in the study. Self-report data were collected using structured questionnaires including the Chinese Illness Perception Questionnaire-Revised (CIPQ-R), the Medication Adherence Inventory (MAI), and the Inventory of Adherence to Self-Management (IASM). Additional data included demographics, health-related characteristics, weight, height, and blood pressure. Analysis involved use of descriptive statistics, two-sample-*t*-test, ANOVA, correlational

analysis, and hierarchical regression. Of the 163 participants, 69 were male and 94 were female. The mean body mass index was 24.58 (*SD* = 3.51). The hypertension control rate was 28.80% with the mean systolic blood pressure of 146.59 mmHg (*SD* = 16.87) and the mean diastolic blood pressure of 80.52 mmHg (*SD* = 12.64). Participants rated balancing factors such as feeling overworked and sleeping problems as the main causes for hypertension. Gender, age, and household annual income were associated with diastolic blood pressure, explaining 23% of the variance in the regression model. Illness coherence contributed an additional 2%.The study findings offer implications for health care and future research. Rural adults need education on causes and consequence of hypertension. Recommendations from the study include education on healthful diets and behaviors to manage hypertension, especially for those who have higher incomes. In mainland Chinese populations, illness perception may not be directly associated with blood pressure. Lastly, the CIPQ-R and ISMA measures require validation and potential revision for use with rural Chinese populations.

CHAPTER ONE

INTRODUCTION

The prevalence of hypertension is increasing each year worldwide (Kearney et al., 2005). Globally, the prevalence of hypertension in adults aged 25 or older was around 40% in 2008 ("World health day 2013," 2013). A high incidence of hypertension is a major health challenge in China. It was estimated that about 972 million Chinese adults had hypertension in 2000 and the number of hypertensive adults would increase to 1.56 billion by 2025 (Kearney et al., 2005). The prevalence of hypertension in China has been increasing dramatically since the 1950s. National Blood Surveys conducted in 1959, 1979, 1991 and 2002 reported prevalence of 5%, 8%, 14%, and 18% among people age 15 years and above in China (L. D. Wang, 2005). Feng, Pang, and Beard (2014) conducted a national survey of Chinese adults aged 45 and above between 2011 and 2012. They reported a 40% prevalence of hypertension. Despite the rapid increase of hypertension in China, the hypertension control rate is quite low. This fact requires investigation of the causes of poor hypertension control. The goal of this research was to understand the influences of demographic and health–related characteristics, illness perception and medication and self-management adherence on blood pressure control. In this chapter the problem of hypertension among Chinese adults is described, the purpose and aims of the study are delineated, and the significance of this research for the people of China is discussed.

The Problem of Hypertension

Hypertension Prevalence in Mainland China

Current studies conducted in different regions of China have indicated the high prevalence of hypertension (Feng et al., 2014; Gu, Qi, Li, & Niu, 2011; Z. Sun et al., 2010). A recent study surveyed 46, 239 Chinese adults 20 years of age or older and found a prevalence rate of hypertension of 26.6% (Gao et al., 2013). The age-specific prevalence of hypertension was found to be 13%, 37%, and 57% among 20-44 years, 45-60 years, and those who were 65% years or older, respectively (Gao et al., 2013). This indicates the prevalence of hypertension increases with age (Ueshimo, Zhang, & Choudhary, 2000). In a systematic review of 27 studies with a total of 195,027 participants, the pooled overall prevalence of hypertension in Chinese cities was 21.5% (Ma et al., 2013). This study also indicated that the prevalence of hypertension was higher among the population in northern China than in the south, higher in men than in women, in larger than in mid-sized or small cities and, finally, higher in cities than rural in areas. In contrast, Gao et al. (2013) reported that the disparity of prevalence disappeared between urban and rural people in the northern region of the country. A study conducted in the villages of Liaoning province in northern China revealed that among 46,923 people, 30% of men and 23.4% of women developed hypertension during 28 months of follow-up (Z. Sun et al., 2010).

Zhejiang province is one of the most developed and richest regions in Southern China with about 56 million people. A survey of 17,437 residents, carried out by H. Wang et al. (2013) in 2010, showed the overall prevalence of hypertension in Zhejiang province was 30%; an increase of 14% when compared with findings from a 2002

National Survey. This finding demonstrated a higher prevalence of hypertension than that in northern China but researchers did not analyze the difference between the prevalence of hypertension in urban and rural area.

Factors Associated with Prevalence of Hypertension

Factors associated with hypertension are numerous. Ethnicity is one of the risk factors associated with the disparity in the prevalence of hypertension. The prevalence of hypertension in the Mongolian population was higher than in the Han (Z. Sun et al., 2008).

Diet is a vital factor in the development of hypertension. A study conducted in Shengli Oil Field, China, with 26,680 hypertensive patients showed that body mass index (BMI) interacting with alcohol intake influenced systolic blood pressure (Gu et al., 2011). Accumulated evidence demonstrates the incidence of hypertension is increasing rapidly due to the acquired urban and westernized lifestyle, food habits (Hou, 2008; Z. Sun et al., 2010), and advancing economic development (Gao et al., 2013). A cross-sectional study in 2002 with 23,671 participants aged 18 to 57 years (D. Wang et al., 2011) was conducted in China to explore the relationship between hypertension and three different diet patterns, namely, "western," "traditional northern," "traditional southern." The findings demonstrated the highest rate of hypertension was associated with a western diet pattern. A lower prevalence of hypertension was related to traditional southern diet and the traditional northern diet pattern after adjusting for body mass index (D. Wang et al., 2011). This study covered all 31 provinces, autonomous regions, and municipalities in China with participants stratified to strengthen study representativeness. Although, the study supported diet as a factor contributing to the development of hypertension, the

method of defining the diet patterns was too general for a regional study in hypertension related topics.

Several studies demonstrated that the prevalence of hypertension was associated with age, geographical location, diet, gender, smoking status, alcohol intake, overweight and/or obesity. Chinese researchers reported that the high intake of salt and oil in urban and rural populations contributed to a high prevalence of hypertension (J. Chen & Zhao, 2012). The Chinese 2010 hypertension prevention and treatment guidelines indicated that 60% of hypertension is salt – induced hypertension (L.S. Liu, 2011). Liu and colleagues surveyed 20,087 rural adults aged 25 years and above in Shandong province. The purpose of the study was to compare the prevalence and risk factors of high-normal blood pressure and that of hypertension. Family history of hypertension, high alcohol intake, BMI, and diabetes were the common risk factors for both high-normal blood pressure and hypertension (J. Liu et al., 2008).

Hypertension Treatment and Control

In light of the high prevalence, a critical reality in China is that the rate of awareness, treatment and control of hypertension remains quite low, and varies from one place to another (J.Liu et al., 2008). In some areas, the treatment rate is zero percent (S. Yang et al., 2011). The China National Diabetes and Metabolic Study in 2007-2008 revealed that 45% of the people with high blood pressure were aware of their condition, 36% were treated, and 11% had hypertension adequately controlled (Gao et al., 2013). The rates of awareness in both Mongolian and Han populations (30% vs 29%), treatment (24% vs 24%) and control (0.7% vs 1.2%) were very similar and relatively low (Z. Sun et al., 2008). A more recent Chinese national survey on hypertension awareness, treatment

and control revealed 40% of hypertensive adults were unware of their condition, about 50% were not receiving medication, and in 80%, the condition was not well controlled (Feng et al., 2014). A study conducted in Zhejiang province demonstrated 54% were aware of their condition, 46% were receiving treatment, and in 18% hypertension was controlled. The unawareness rate among the 18-44 age group was 73%, which made up 21% of those unaware of their hypertension status (H. Wang et al., 2013). Wang and his colleagues did not make further comparison between the prevalence in rural and urban area (H. Wang et al., 2013). Another report from 2000 China Health and Nutrition Survey showed that the prevalence of hypertension was 13.3% and 15.9% among rural and urban adults, respectively (Hou, 2008). Among hypertensive adults, 64% were undiagnosed and 78% were untreated in rural areas while 50% were undiagnosed and 66.3% were untreated in urban areas (H. Wang et al., 2013).

In summary, hypertension is a major public health problem in China as well as in other countries around the world. Chinese rural adults comprise a significantly high proportion of undiagnosed and untreated hypertension, which produces a financial burden for both farmers and government (Cai, Zhu, Dong, & Zhao, 2012). It is known that uncontrolled hypertension is a major risk for morbidity and mortality in cardiovascular, cerebrovascular, and chronic kidney diseases (Ramli, Ahmad, & Paraidathathu, 2012). Therefore, the low rate of control deserves a rigorous investigation to determine what variables predict blood pressure management.

Illness Perception and Its Influence on People's Health Behavior

What prevents people from using health care for early detection of hypertension and in participating in their treatment? S. L. Chen, Tsai, and Chou (2011) point out that

Chinese people seek health care and maintain high adherence to treatment regimens only when the condition becomes serious. For many Chinese, health is having the ability to eat, sleep, and have regular bowel movements. However, many health problems do not affect these bodily functions at an early stage and may not even during the later stage. Hypertension, particularly, is asymptomatic during the early stage. Thus, hypertension may remain untreated until the symptoms have become severe. The above description of health seeking behavior and/ or treatment adherence of Chinese people suggest that people's perception of health and illness could lead to differing outcomes.

Illness perception, as the lay viewpoint of illness, could affect life expectations, health-related behaviors, and future health status (Pagels, Söderquist, & Heiwe, 2012; Scharloo et al., 2007). For example, Fischer et al, (2010) found illness perception to be related to coping, self-management, and well-being in chronic obstructive pulmonary disease (COPD). Therefore, how people perceive their health and illness may be a key factor in predicting their health behavior and, consequently, health outcomes.

Illness perception, and its influence on patients' coping strategies and outcomes, has been studied primarily in the United States (Dela Cruz & Galang, 2008; Fowler & Bass, 2006; Pickett, Allen, Franklin, & Peters, 2014; Vaeth & Willett, 2011), the United Kingdom (Griva, Jayasena, Davenport, Harrison, & Newman, 2009; Groarke, Curtis, Coughlan, & Gsel, 2005), the Netherlands (Scharloo et al., 2007), Japan (Matsumura et al., 2013), Korea (Park, Kim, Jang, & Koh, 2013), and Taiwan China (S. L. Chen, Tsai, & Lee, 2009). Hagger and Orbell (2003) conducted a meta-analysis to explore the relationship between illness perception and coping strategies, and illness perception and health outcomes. Their findings suggested that patients who perceived their illnesses as

curable or controllable tended to have better outcomes. Their analysis also provided evidence for theoretically predictable relations between illness cognitions, coping and illness outcomes (Hagger & Orbell, 2003).

Chen and colleagues explored illness perception of hypertension among hypertensive patients in Taiwan (S. L. Chen et al., 2009). The researchers found that illness identity, as one dimension of illness perception, may directly affect patient adherence to medication leading to the outcome of better blood pressure control (Chen et, al., 2011).

Still, little is known about illness perception and its influence on hypertension control among adult hypertensive patients in mainland China. In addition, to date, no research from the mainland of China has shown the variables that might influence hypertension control. Therefore, a comprehensive study in the mainland of China to explore the strongest predictors for blood pressure and understand the Illness Perception of Chinese rural adults toward hypertension and its influence on hypertension control would contribute much-needed knowledge of this condition.

Adherence to Medication and Self-management

Authors use the terms Adherence, Compliance, and Concordance interchangeably in the literature (Bissonnette, 2008; Lahdenper & Kyngas, 2000). Through a comprehensive concept analysis, Bissonnette (2008) reported that no differences existed among these words and the most common definition for adherence was the extent to which patients followed the instructions regarding prescribed treatments.

Adherence to Medication

Johnson developed the Medication Adherence Model (MAM) specifically to understand the process of medication adherence in the context of hypertension control (Johnson, 2002). It was a midrange theory involving cognitive (Purposeful Action and Feedback) and non-cognitive (Patterned Behavior) processes. The adherence process in MAM included three core concepts, namely, Purposeful Action, Patterned Behavior, and Feedback. Johnson (2002) explained three core concepts, adherence or non-adherence to medication (Johnson, 2002).

First, persons take Purposeful Action based upon the perceived need for and the perceived effectiveness, and safety of their medication. This results in intentional medication taking behavior. Perceived need referred to perceived symptoms such as headaches, tachycardia, or not feeling well, perceived desire to improve health, and perceived threat to health. Perceived effectiveness was an individual's estimation for the effectiveness of medication in controlling blood pressure and improving health. Perceived safety was the sense that the prescribed medication was safe. Secondly, patterned behavior was a non-cognitively developed ritual, habit, or pattern of taking hypertensive medications stimulated through access, routine, and remembering. According to Johnson (2002), individuals needed to be able to physically or financially access medications and remember to take the medications. Access was a non-cognitive process in the MAM. Routine involved timing and location, tailored to the individual's lifestyle. Without the patterned behavior, purposeful action could disappear as interruptions occurred. Finally, the last concept in the MAM, feedback, was also critical to medication adherence. It included monitoring blood pressure, personal responses,

media messages, and comments by health care providers. The current study uses MAM as a theoretical explanation for the patterned behaviors of medication taking.

Adherence to Self-management

According to Bosworth and colleagues (2010), self-management involved "engaging in activities that promote physical and psychological health, interacting with health care providers and adhering to treatment recommendations, monitoring health status and making associated care decisions, and managing the effect of the illness on physical, psychological, and social functioning" (p. 567). Self-management is a broad concept for chronic diseases, including hypertension. Bosworth and colleagues (2010) stated that self-management for hypertension includes not only lifestyle modification, but also self-monitoring and interacting with health providers. Accumulated evidence has indicated that self-management aimed at lifestyle modification contributed to better blood pressure control (S. L. Chen et al., 2009; Park, Chang, Kim, & Kwak, 2013).

Problem Statement

Poor hypertension control is currently a problem leading to serious consequences such as increased morbidity and mortality in China. Very limited evidence exists about factors associated with blood pressure control in the Chinese population. Based on research in other countries, those factors likely include demographic and health-related characteristics, illness perception and adherence to treatment. Evidence from studies in other countries suggests that illness perception affects illness outcomes (Hagger & Orbell, 2003) . No literature has reported how well illness perception of Chinese rural adults with essential hypertension predicts blood pressure. The lack of information on the

abovementioned variables can hinder the development of strategies that encourage people to take prompt actions to prevent and treat hypertension.

Purpose and Aims of the Study

The purpose of this study was to examine the relationship among demographic and health-related characteristics, illness perception, and adherence (adherence to medication and adherence to self-management), and blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. This study aims to:

1. Describe the demographic and health-related characteristics, levels of illness perception, medication and self-management adherence, and systolic blood pressure and diastolic blood pressure in the study sample.
2. Examine the association between demographic and health-related characteristics and blood pressure.
3. Examine the relationship between illness perception and blood pressure.
4. Examine the relationships of adherence to medication and adherence to self – management with blood pressure.
5. Determine how well the demographic and health-related characteristics, illness perception, and medication and self-management adherence predicts blood pressure.

Definitions of Major Constructs

The paragraphs that follow define major constructs used in this study.

Hypertension

Hypertension or high blood pressure is defined as having persistent elevated

systolic blood pressure of 140 mmHg or above and/or diastolic blood pressure of 90 mmHg or above at three different occasions measured the same way (Roumie et al., 2011; Z. Sun et al., 2010). A systematic review of 11 Clinical Practice Guidelines (CPGs) published in English between January 2006 and September 2011 showed a high consensus on the above criteria to diagnose hypertension (AI-Ansary et al., 2013) and these criteria were also found in Chinese CPGs for hypertension management (L. S. Liu, 2011). Control of blood pressure is defined as systolic blood pressure < 140 mmHg and diastolic blood pressure < 90 mmHg (H. Wang et al., 2013).

Rural Adults

In China, "rural," or "agricultural village" is defined as the places for agricultural cultivation such as ranches, forests, farms, and gardening and vegetable production areas ("Agricultural village," 2013). Chinese define the adult as a person 18 years or older.

Illness Perception

According to Leventhal and colleagues' Self-Regulation Model (SRM), illness perception is the lay beliefs of illness including cognitive and emotional representation (Leventhal et al., 1997). In the Self-Regulation Model (SRM), cognitive representation encompasses five dimensions: identity, cause, time line, consequences, and curability/controllability which were included in the original illness perception Questionnaire (Weinman, J, Moss-Morris, & Horne, 1996). Emotional representation perspectives were neglected in the original Illness Perception Questionnaire. Later, Moss-Morris, Weinman, Petrie, et al., (2002) added timeline cyclical, illness coherence to

further describe illness perception and reorganize the concepts into three components, namely, illness representation, identity, and cause. Moss-Morris et al. further developed each of the three aforementioned components into additional variables. They organized emotional representation into the concept of illness representations. This current study used illness representation, identity, and cause subscales to collect data for illness perception. The following is the introduction for each of these three components, to be further described in Chapter 3.

Illness Representation

Illness representation (IR) is the individual's beliefs of illness. IR has been further broken down to seven variables by Moss-Morris, Weinman, Petrie, et al. (2002). Those seven variables are timeline, timeline cyclical, illness coherence, consequences, personal control, treatment control, cure/curability. Timeline and consequences are the predictive beliefs about how long the condition might last and the consequences of the condition. Timeline cyclical denotes the variations of the disease, while illness coherence is the extent of patients' understanding of their diseases. Treatment control and personal control are individual's beliefs about the best way to control their condition and effectiveness of the treatment. Finally, curability/controllability is about the degree to which the individual plays a part in achieving this. Emotional representation refers to the emotional reactions to the illness (Moss-Morris et al., 2002). For the scale of illness representation, confirmatory factor analysis indicated two latent constructs (control and negative IR) underlying the factors of personal and treatment control, consequence, emotional

representation, and time cyclical (S. L. Chen et al., 2011). Thus, the current study used IR with four factors including timeline, negative IR, control, and illness coherence

Identity

Identity is the label or name individuals give to the condition and their symptoms that appear to go with it. Different people give the same symptom a different name, which involves an individual perception of the illness (Leventhal et al., 1997).

Cause

Cause is the individuals' assumptions about what triggers the illness. Moss-Morris, Weinman, Petrie, et al. (2002) suggested that causes included four factors, namely, psychology, risk factors, immunity, and accident/chance. Considering the nature of hypertension, S. L. Chen and colleagues (2009) replaced the immunity and accident with balance and cultural attributions to make it more culturally appropriate for persons of Chinese cultural background.

Adherence

Adherence to Medication

Medication adherence refers to the individuals' purposeful behaviors that comply with prescribed pharmaceutical therapy. The behaviors involved intentionally increasing, intentionally decreasing, or unintentionally deviating from the prescribed medication therapy. The intentional decrease type of dosage deviation included reducing dosage, frequency and numbers of medication, taking only part of the prescribed medication, and not consuming all the medication. The increase type of dosage deviation, then, involved

adding dosage, numbers of medication, and frequency. The unintentional type of deviation included taking medication intermittently, deviating in timing, forgetting and/or omitting the medication.

Adherence to Self-management

Self-management adherence for the current study refers only to the lifestyle an individual adopted for hypertension management. The measure used in this study to assess adherence to self-management included items about unhealthy diet choices such as extra seasoning, salty food, fatty meats, organ meats, deep fried food or healthy diet choices such as, increasing consumption of fresh food or vegetables, attending to food labelling, dieting for weight control, increasing exercise, and keeping health care appointments.

Health Outcomes

According to Leventhal et al. (1997), health outcomes include "disease state, physical functioning, role functioning, social functioning, psychological well-being or distress, and vitality" (p.48). Disease state refers to the signs and symptoms of the illness. In this research project, the outcome variable will be blood pressure (BP). Accumulated evidence has suggested that systolic blood pressure (SBP) may be a better indicator than diastolic blood pressure (DBP) for cardiovascular risk, mortality of stroke, and chronic heart disease (Strandberg & Pitkala, 2003; Tin, Beevers, & Lip, 2002). It also plays an important role in determining hypertension stage and choice of treatment (Lloyd-Jones,

Evans, Larson, O'Donnell, & Levy, 1999). However, the importance of diastolic blood pressure (DBP) cannot be ignored (Tin et al., 2002).

Significance of the Study

There have been numerous studies on factors associated with blood pressure, but illness perception does not appear in the literature as one of the factors related to blood pressure control. Other than studies reported by Chen et al., (2009; 2011) in Taiwan, studies of illness perception related to blood pressure could rarely be found in China, With the current status of poor control of hypertension among rural adults in the mainland of China, the current study may inform nursing and thereby affect public health. A description of the potential significance follows.

Significance to Nursing Practice

The findings of this study may contribute to nursing practice in China in several ways. Establishing an influencing relationship between demographic data and health-related characteristics, illness perception, adherence to medication and self-management and blood pressure among rural hypertensive adults, will guide nurses to promote hypertension control through the modification of changeable factors. Furthermore, nurses could anticipate patients' blood pressure control if the predictive value is established. Clinical nurses can implement early interventions to enhance blood pressure control. Identifying the best prediction model for blood pressure control will aid in developing enhanced, comprehensive, blood pressure control measures.

Significance to Nursing Education

This study provides new knowledge about the factors influencing blood pressure among rural Chinese. With updated understanding of hypertension control, student nurses and graduates will be better prepared to educate rural adults in hypertension management. Ideally, this study will stimulate further questions among nursing students to search for better ways to control blood pressure.

Significance to Nursing Research

The findings of this study will lay a foundation for future researchers who can conduct research projects to develop much-needed scientific nursing knowledge about ways to improve hypertension control. For example, a quick illness perception measurement tool can be developed, through further investigation, to detect negative illness perception and provide valuable education that might improve patients' adherence. This study can also be a reference for researchers in other cultures to undertake similar studies.

Significance to Theory Development

This study may either support existing theories or models in illness perception or stimulate development of culturally sensitive illness perception models related to hypertension. It may provide information for a more comprehensive theory and model of hypertensive patients' adherence. In addition, this study provides empirical findings to either support or challenge the established relationship among the variables in the Self-Regulation Model, which can allow further refinement of the theory.

CHAPTER TWO
LITERATURE REVIEW

The purpose of this chapter is to review and critique the empirical and theoretical literature on adult hypertension management, adherence to drug and non-drug therapies that serve as a major variable in blood pressure control, and the variables influencing adherence rates in the Chinese population. This chapter also includes a review of illness perception and its relationship with adherence and influencing variables. This chapter focuses on literature written in both English and Chinese. The review uses the variables of hypertension, hypertension management, adherence to anti-hypertensive drugs and self-management, and illness perception as its organizational scheme.

Literature Search Strategies

Literature searches began in the main databases for nursing: Academic Search Premier, CINAHL Plus with Full Text, and Health Source Nursing. Further searches included PubMed and Cochrane Library. Key search terms included hypertension AND management, hypertension AND adherence OR compliance, concept analysis AND adherence or compliance, hypertension AND self-management or self-care, illness perception OR illness representation, AND Common Sense Model. For each search, "Chinese" as an extra key word was added. The key word of "Asian" was used if there were no studies available with a Chinese population. Chinese databases, namely WeiPu and Wanfang were searched if there were English abstracts available in EBSCO databases. Medication adherence AND hypertension, self-care AND hypertension, rural

adults AND hypertension were searched in Chinese databases. ProQuest was also searched for illness perception or illness representation AND hypertension. Limiters such as years of publications (2006-2014 and earlier if there were no recent publications available), full text, scholarly (peer reviewed) journals, all adults were used to produce a focused literature review. As a result, the search yielded about 305 articles, which include 252 research articles, three systematic reviews, 15 theoretical and 35 opinion papers. Titles and abstracts were screened to select the relevant articles for full text review. Five duplicate articles were excluded. The inclusion criteria for final review were the articles that focused on Chinese population unless there was no Chinese population research available, and the articles published in recent five years unless there were no recent publications. In the end, 149 articles were reviewed.

Review of Related Research

Hypertension Management

Overview of Practice Guidelines for Hypertension Management

Experts in different countries have developed Clinical Practice Guidelines (CPGs) to effectively manage hypertension. All CPGs recommend both drug therapy and life-style modification, including diet, exercise and so on is required to treat hypertension. Al-Ansary and colleagues (2013) conducted a systematic review comparing 11 CPGs for quality and consistency of diagnosis, assessment, and management of hypertension. In this systematic review, a comprehensive search in MEDLINE, EBASE, websites, and Google using Medical Subject Headings and text words related to hypertension and

guidelines yielded 2168 articles. Two independent reviewers reviewed all the articles and removed 234 duplicated articles and excluded 1819 articles after screening the titles and abstracts. Only 114 articles remained for full-text screen. The inclusion criteria for final review were the articles exclusively focused on hypertension published from January 2006 to September 2011 and written in English and did not include CPGs that focused on hypertension among specific population groups such as elderly, pregnant women and special settings (primary care only or emergency care only). Ultimately, 11 articles with 11 CPGs were included in the systematic review. Two independent raters assessed the quality of CPGs by using the instrument, AGREE-II. Findings included identification of nine CPGs developed at the national level and two at regional levels. Most guidelines recommended similar life style changes with minor differences in dietary supplements, increase of potassium intake, exercise, and stress and emotional management. All eleven CPGs emphasized the need to stop smoking, maintain weight, follow nutritional guidelines, and lower sodium intake. Ten Guidelines recommended decreasing alcohol intake and fat intake. Most CPGs recommended use of any of the five classes of antihypertensive drugs including angiotensin converting enzymes inhibitors, angiotensin receptor blockers, beta-blockers, calcium channel blockers, or diuretics.

In summary, all CPGs (AI-Ansary et al., 2013) recommended combining treatment regimen of drug therapy and lifestyle change as standardized hypertension management. Lifestyle change involved following nutritional guidelines, exercising, coping with stress, managing emotions, stopping smoking and drinking, and controlling

weight. The recommendations for lifestyle change were behaviors of self-management that a hypertensive individual needed to follow. The systematic review described above was limited to CPGs published in English, which might miss the ones written in other languages. In fact, this systematic review did not identify any Chinese hypertension management guidelines. Therefore, it was necessary to review Chinese guidelines for hypertension management as they may vary due to unique cultural factors.

Chinese Practice Guidelines for Hypertension Management and Practice

According to Chinese Hypertension Management Guidelines published in 2012, strategies for hypertension control should include drug therapy and none-drug therapy (L. S. Liu, 2011). AI-Ansary et al. (2013) in their systematic review conclude drug therapy involves use of the five classes of the antihypertensive drugs. Non-drug therapies included decreasing salt intake, and increasing potassium intake, controlling weight, ceasing smoking, exercising, limiting alcohol intake, and managing stress. Life-style modification recommended by Chinese CPGs is similar to those synthesized from 11 guidelines in the aforementioned systematic review of Western CPGs (AI-Ansary et al., 2013). In Chinese guidelines, under the category of decreasing salt intake, emphasis is on reducing extra seasonings, substitute salts such as soy sauce, processed vegetables and meat intake, and increasing vegetables and fruit intake.

In addition to the recommended five classes of antihypertensive drugs, Chinese rural hypertensive adults usually take antihypertensive compounds called Beijing antihypertensive No. 0 in China. This medication, contains hydrochlorothiazide 12.5mg,

Reserpine 0.1mg, Triamterene 12.5mg, and Dihydralazine Sulfate 12.5 mg. Due to its availability, low price, and the need to take only one tablet a day, these compounds are commonly used among rural hypertensive patients. Some studies reported in Chinese journals reported good blood pressure control with this medication in both the short and long term when compared with other anti- hypertensive drugs (N. L. Sun et al., 2012; Tan, Hua, Liu, & Yang, 2006; Yan, Sun, & Hong, 2003). This finding is probably due to the fixed-dose combinations requiring only one tablet per day, thus promoting higher adherence. This higher adherence to a one dose per day was supported by Bangalore and colleagues (2007). They had conducted a meta-analysis to compare adherence to fixed-dose combinations versus free drug therapy regimens. The authors found that patients taking fixed-dose combinations reduced non-compliance by 24%, which may lead to a better clinical outcome. Surprisingly, however, sometimes high adherence does not result in a better clinical outcome (Yu, Zhang, & Wang, 2013). This finding may be due to the ineffectiveness of the medication itself. Since Beijing antihypertensive No. 0 has been shown to be effective in lowering blood pressure (N. L. Sun et al., 2012; Tan et al., 2006; Yan et al., 2003), it is possible that adherence to Beijing antihypertensive No. 0 will result in lowering blood pressure if the participants take this fixed-dose combinations.

A few studies reported the effectiveness of complimentary therapies such as herbal fomentation (Li, Kuo, Hwang, & Hsu, 2012; Tong, Yu, & Leng, 2012), acupuncture and food therapy (Shen, Pang, Kwong, & Cheng, 2010) on blood pressure control with the result of either temporary or ambiguous anti-hypertensive effects. Due to

cultural traditions, Chinese people tend to take herbs, which they obtain personally independently or from a physician. Many times, however, patients do not disclose the use of Traditional Chinese Medicine (TCM) to their health care professionals (Hsu, Mao, & Wey, 2010; Li, Wallhagen, & Froelicher, 2008). The contents of the TCM CPGs for hypertension include classifications of the hypertension, drug therapy, and life-style modification focusing on balanced diet and mental health (Shi, Han, Yu, Wang, & Lu, 2013). Although, CPGs for TCM to control blood pressure were available, the CPGs for TCM on hypertension control are inconsistently applied 55% of the time, according to a review of 417 studies (Shi et al., 2013). This misapplication of TCM CPGs can include inappropriate types of TCM or inappropriate dosing of TCM. These findings imply that physicians in clinics may inappropriately prescribe the TCM for hypertensive patients.

Summary

Chinese hypertension management guidelines indicated both drug therapy and non-drug therapy are important in blood pressure management (L. S. Liu, 2011). Chinese guidelines indicated that self-management involved balanced diet, limiting alcohol intake, exercise, and stress management. No Chinese literature reported how rural adults with hypertension, in Zhejiang province and other provinces of China, used self-management behaviors .

Variables Influencing Blood Pressure

The purpose of this study was to examine the relationship among demographic and health-related characteristics, illness perception, and adherence (adherence to

medication and adherence to self-management) and blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. It was necessary to understand what the literature has presented about above-mentioned factors associated with blood pressure and significant prediction model.

Variables such as diabetes, previous diagnosis of heart failure, previous diagnosis of peripheral artery disease or stroke, obesity, and lipid-lowering treatment affect blood pressure (Orozco-Beltrán et al., 2008). A comprehensive literature review identified other variables such as demographic and health-related characteristics, adherence to treatment regimen, and illness perception of the diseases that influence blood pressure.

Demographic and Health-related Characteristics and Blood Pressure

Demographic and health-related characteristics play an important role in blood pressure control. No study was found specifically to identify the personal factors associated with blood pressure control, but demographic and health-related characteristics were often included in prediction studies with other predicators such as adherence (Li, Wallhagen, & Froelicher, 2010; Xu et al., 2013). The literature contained some personal factors related to blood pressure. For example, a community-based cross-sectional survey, conducted in Zhejiang province, investigated the up-to-date prevalence, the rates of awareness, treatment and control of hypertension, and the factors associated with awareness, treatment and control. Researchers recruited participants (N = 19,113) through multistage stratified random cluster sampling. The inclusion criteria were people who were ≥ 18 years old in the chosen household and met the following criteria of having had

no stroke, dementia, schizophrenia, not being ill in bed or deaf and dumb during the survey study. Multiple indicators such as systolic blood pressure (SBP), diastolic blood pressure (DBP), awareness of hypertension, treatment, control (SBP < 140 mmHg, DBP < 90 mmHg) were collected to serve the aims of the study. Among participants receiving the medication for treatment of hypertension, demographic and health-related characteristics such as gender, age, education, living in urban areas, being overweight or obese were analyzed using logistic regression to identify the factors associated with poor blood pressure control. Findings indicated that old age (OR = 1.81) [age 45-59] and 1.63 [age ≥ 60] vs age 18-44 were related to better blood pressure control. Poorer control was associated with living in the urban (OR = 0.81), low education attainment (OR = 0.41), being overweight (OR = 0.76), and obesity (OR = 0.67).

This study (H. Wang et al., 2013) was not conducted with a sole aim to find the association between personal characteristic and blood pressure. The demographic and health-related characteristics included in analysis such as age and education were collected as categorical data rather than continuous data, which would have provided more rigor. In addition, the cross-sectional design of this study does not establish the causal relationship of the demographic and health-related characteristics and blood pressure. Moreover, some of the patients were also diabetic, and Orozco-Beltrán et al. (2008) reported that blood pressure was influenced by diabetes. In this study (H. Wang et al., 2013), gender was not a significant factor, which was different from that reported by Li et al. (2010). However, this study is informative to the current study in that

demographic and health-related characteristics such as age, education, living in urban area, being overweight, and obesity were factors influencing blood pressure control. Being overweight and obesity related to high blood pressure were supported by another study reported by Xu et al. (2013).

In the study conducted by Xu et al. (2013), the participants (N = 3279) were hypertensive patients with coronary heart diseases (CHD) from a cross-sectional large multicenter research project involving 52 centers in six cities including Zhejiang. Researchers defined hypertension as SBP ≥ 140 mmHg, DBP ≥ 90 mmHg and uncontrolled blood pressure as SBP ≥ 130mmHg or DBP ≥ 80mmHg. The mean age of the participants was 65 years. Mean Body Mass Index (BMI) was 25 Kg/m^2. Most patients (83%) took one or more drugs of five categories of anti-hypertensive drugs. Demographic data and clinical characteristics of hypertensive patients with CHD were treated as independent variables for blood pressure control. Multivariate logistic regression showed that uncontrolled blood pressure was associated with higher BMI, the presence of stable angina pectoris, use of calcium channel blockers, myocardial infarction (MI), and family history of diabetes. Age and gender were not associated with blood pressure control in the aforementioned literature. BMI ≥ 24 and ≤ 28 means to be overweight ("Criteria of weight for adults," 2013). The findings of this study (Xu et al., 2013) suggested that demographic and health-related characteristics of being overweight and obesity were associated with blood pressure. This study also has its limitations, such as the participants were hypertensive with CHD. The blood pressure control was stricter

than that of hypertensive patients without CHD or diabetes. The cross-sectional research design could not establish a causal relationship, however.

These two Chinese studies described above had similar findings on the effects of being overweight or obese on blood pressure control (H. Wang et al., 2013; Xu et al., 2013). Age was associated with blood pressure control in one study (H. Wang et al., 2013). Gender was not a predictor of blood pressure control in either study, but was reported as a predictor of blood pressure in a study reported by Korean researchers (S. J. Yang, Jung, & Choi, 2010) and among elderly Chinese immigrants in the United States (Li et al., 2010). In addition, low education attainment and urban living were two factors predicting poor blood pressure control (H. Wang et al., 2013). However, other demographic and health-related characteristics such as yearly income, length of diagnosis, living arrangement were not included in data collection and analysis, but were reported as significant variables for adherence to medication or self-management among hypertensive patients in the study conducted by S. L. Chen et al. (2009).

Summary for Demographic and Health-Related Characteristic and Blood Pressure

Demographic and health-related characteristics such as age, gender, years of education, yearly income, length of diagnosis, and BMI may influence blood pressure. The predictive value of the demographic and health-related characteristics varies for different groups of people, and with different accompanied diseases. Thus, investigation is needed to test whether demographic and health-related characteristics influence blood pressure in rural dwelling hypertensive adults. In the current study, regression analysis

included demographic and health-related characteristics such as age, gender, education, being overweight or obese, length of diagnosis, and yearly household. The current study excluded those hypertensive adults with any other significant chronic physical comorbidity that involved pharmacological therapy such as diabetes mellitus, previous diagnosis of heart failure, and previous diagnosis of peripheral artery disease or stroke as these conditions may also influence the blood pressure control.

Adherence to Treatment Regimens

Adherence to treatment regimens including adherence to drug therapy and self-management was the most reported variable influencing blood pressure in the literature reviewed. A great number of non-Chinese studies have revealed that higher adherence to medication or self-management could enhance the blood pressure management (Bosworth et al., 2010; Hacihasanoglu & Gozum, 2011; Morgado, Morgado, Mendes, Pereira, & Castelo-Branco, 2011; Natarajan, Santa Ana, Liao, Lipsitz, & McGee, 2009).

Medication Adherence and Blood Pressure

Chinese studies have found that adherence to medication influenced blood pressure. A longitudinal study with a three-month follow-up was conducted in 2006-2007 to find out the predictors for blood pressure control among 90 Chinese immigrants to the United States of America (Li et al., 2010). The inclusion criteria were Chinese immigrants aged 65 years and older who spoke Mandarin, had hypertension, took antihypertensive medication, and were in stable condition, with no psychiatric problems. The predictors including demographic data (age and gender), medication-related

variables (numbers of medication, frequency of oral medications), length of diagnosis, knowledge of hypertension management, blood pressure, and adherence to medication were measured at baseline. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were taken three months afterward. The primary dependent variable was SBP, while DBP was treated as secondary variable. Li and colleagues used multiple regressions for prediction modelling. The age range of the participants was from 66–92 years with 50% of male and 50% female. The majority was married and had less than a high school education. The median annual household income was less than annual average U.S. household income. Less than 50% of the participants had their hypertension under control. The findings showed that more medications ordered and lower adherence to medication was the two predictors for higher systolic blood pressure, while male gender, and lower adherence predicted higher diastolic blood pressure. In addition, older age was associated with higher SBP; the finding was not statistically significant, but deserves further investigation.

This study (Li et al., 2010) surveyed Chinese elderly immigrants and the sample size was relatively small. The findings may not represent rural Chinese hypertensive adults in all age ranges in southern China. Moreover, low medication adherence was associated with higher number of medications in some studies (Bangalore, Kamalakkannan, Parkar, & Messerli, 2007; Quine, Steadman, Thompson, & Rutter, 2012), resulting in poor blood pressure control. In Li and colleagues' study higher number of medications and low adherence served as two separate predictors for elevated systolic

blood pressure. This may suggest that higher number of medications affected blood pressure either directly or indirectly through adherence. Although Li and colleagues' (2010) study had some limitations, its findings of the possible variables (age and lower adherence) influencing SBP are instructive to the current study.

Adherence to medication as a variable influencing blood pressure was also supported by non-Chinese population studies (Shah, Steiner, Vermeulen, Fleming, & Cory, 2007; Shaw & Bosworth, 2012). In addition, age was one of demographic and health-related characteristics associated with higher level of SBP, but not with DBP. This may be due to the phenomenon that DBP usually increases with age up to 55 years and decreases after that (Strandberg & Pitkala, 2003). Given that the study population of Li and colleagues were 65 years and above, advanced age should not have affected the DBP. In contrast, age is associated with SBP and this probably is because SBP increases with age (Burt, Whelton, & Roccella, 1995).

Evidence is lacking to support the positive influence of adherence to medication on blood pressure control because very few studies have been conducted in China. However, some researchers reported the findings of medication adherence among Asian countries. For instance, Matsumura et al. (2013) analyzed the data from a random controlled trial (COMFORT) in Japan. Their COMFORT study investigated whether a single pill of combined antihypertensive drugs- Losartan potassium and hydrochlorothiazide, could improve medication adherence. The study took place in 29 Japanese hospitals and clinics. This sequential study analyzed data from the COMFORT

studyto investigate the effects of drug adherence on blood pressure control. There was both a control group and an interventional group. Researchers saw two hundred and four hypertensive patients in a clinic and evaluated adherence by counting the residual hypertensive pills at 1 month, 3 months, and 6 months. Researchers also measured blood pressure at each visit. Researchers divided participants into three groups according low, moderate or high rate of adherence. ANOVA, Chi-square, and Repeated Measures analysis of variance were applied to compare the systolic and diastolic blood pressure among the three groups. The findings showed that SBP and DBP were significantly higher among patients with low-adherence medication rate ($P = 0.02$), after adjusted for age, sex, baseline BP, use of calcium channel blocker, and randomized treatment. Therefore, low- adherence to medication was associated with poor blood pressure control in this Japanese study.

The study (Matsumura et al., 2013) was highly suspected for sampling bias since more than 50% of participants had a high adherence rate. In fact, they conducted this study in Japanese clinics and hospitals and included the population who kept visiting the clinic. It was not surprising to see high adherence among the people who could keep a clinic appointment. In addition, the participants in COMFORT study took a combined anti-hypertensive pill. High adherence was expected according to Bangalore et al. (2007) who reported that fix-dose of anti-hypertensive drug (combining pill) enhanced the medication adherence. The small number of participants also contributed to the limitations of this study. However, despite the aforementioned limitations, this study still

had instructive values for the current study in a Chinese rural population. First, BP control was highly associated with medication adherence, which provided support to examine the predictive value of adherence to blood pressure. Second, the type of medication and selection of non-clinic and hospital settings should be taken into considerations when designing future studies.

In contrast, some Asian studies showed the opposite findings in the relationship of medication adherence to blood pressure control. Shah et al. (2007) pointed out that blood pressure control may not be independently associated with adherence to medication. This conclusion was supported by Xu et al. (2013), suggesting that there were many other variables contributing to blood pressure control, such as being overweight or having high body mass index (BMI), high alcohol intake, presence of stable angina pectoris, the effectiveness of the medication, and a family history of diabetes .

A study was conducted among rural adults (70% aged 55 years and above) in Shandong province to evaluate the effects of a free antihypertensive drug program (Yu et al., 2013). Researchers compared matched samples of 102 program participants receiving free antihypertensive drug and 102 non-program participants for medication adherence, medical costs associated with hypertension, and blood pressure. The characteristics of the intervention and control group were not significantly different, except for education, annual per capita income, health complications, and time since first diagnosed with hypertension. The findings demonstrated that the medication adherence improved greatly

in the group receiving the free antihypertensive drug, but blood pressure control was not statistically different between the two groups.

The researchers (Yu et al., 2013) were not able to evaluate other potential confounders of hypertension control due to small sample size. It may also be because of small sample size or inadequate dosing of the medications that blood pressure levels did not decrease following the increased adherence to medication. Furthermore, the researchers measured medication adherence in this study by fully depending on patients' self-report of taking mediation *most of the time, some of the time, when feeling sick,* and *never*. Therefore, the medication adherence status may not have been fully explored leading to an incorrect conclusion, instead, over estimation occurred.

In summary, medication adherence has been found to influence blood pressure in some studies (Li et al., 2010; Matsumura et al., 2013; Shah et al., 2007; Shaw & Bosworth, 2012). Opposite findings about the effects of medication adherence to blood pressure control were also reported (Bangalore et al., 2007; Yu et al., 2013). Therefore, the association between medication adherence and blood pressure remains uncertain. Further investigation is needed to explore the association between adherence to medication and blood pressure.

Medication adherence and related variables. Many studies have shown that medication adherence was associated with various variables and varied in different cultures. Non-Chinese research findings showed that medication related variables such as dose (fixed-dose, number of medications, and medication frequency) (Bangalore et al.,

2007; Quine et al., 2012) and financial problems (Gross, Anderson, Busby, Erith, & Panco, 2013) were related to medication adherence. Chinese population studies have identified several variables associated with low medication adherence including forgetfulness, depression, experiencing medication adverse effects, and cultural variations (Hsu et al., 2010). Research shows poor socioeconomic status and financial problems are associated with lower adherence (Wong, Jiang, & Griffiths, 2011; Yu et al., 2013).

Besides the aforementioned variables, the literature also shows perceived health status to be correlated with medication or self-management adherence. A cross-sectional study in Hong Kong (Lee G. K. et al., 2013) was conducted to determine the variables contributing to medication adherence. A sample of 1,114 hypertensive adults in the outpatient clinic were recruited based on the inclusion criteria of being a hypertensive patient aged 18 years or older, taking at least one long-term antihypertensive drug, and being able to communicate and understand Cantonese. Each participant was required to complete three self-administered questionnaires assessing basic socio-demographic factors, self-perceived health status, and self-reported medication adherence. The researchers used the Morisky's Medication Adherence Scale to measure medication adherence. A score of greater than "6" was considered as "good adherence, and "6" or below as "poor" adherence. All variables correlated significantly with adherence and were entered into a logistic regression model. After adjusting for confounders, *older age*,

poor or *very poor* self-perceived health, more than 10 years of antihypertensive drug use, and being unemployed or retired predicted good adherence

This cross-sectional study conducted in a single out-patient clinic in Hong Kong reporting variables correlated with medication adherence (Lee G. K. et al., 2013) had several limitations. First, the participants were recruited in one out-patient clinic and the education level was relatively high, which limited the representativeness, and generalizability of the study findings. Since the adherence rate in this study was quite high (61%) it is possible other variables associated with low adherence remain to be tested. High adherence may be related to the fact that these participants attended an out-patient clinic and may generally have higher adherence to any health behavior. The higher adherence rate may also be caused by over-reported medication adherence. Over self-report of medication adherence occurs sometimes in population groups. For example, Li et al. (2008) conducted a study to explore the relationship between demographic, cultural factors, anti-hypertensive medication adherence, and blood pressure control among older Chinese immigrants in the United States and revealed the contradiction of high medication adherence and poor blood pressure control. Li and colleagues (2008) further suggested that high medication adherence was probably caused by over self-report of medication adherence due to social desirability (Li et al., 2008). Secondly, the cross-sectional design of the study did not support causal relationship between the independent variables and medication adherence.

Although the limitations of this study were apparent, the findings were still valuable for the current conducted study. For example, older age and length of medication use predicted adherence, thus providing a good reference for sampling strategy. The current study, avoided sampling bias by collecting the data among all hypertensive adults in the village.

Whereas Lee et al. (2013) found that advanced age influenced medication adherence, other researchers have reported that age and other demographic attributes were not associated with medication adherence (Hsu et al., 2010; Wong et al., 2011), but were associated with blood pressure.

In a cross-sectional study of 94 elderly Chinese Americans, Hsu and colleagues (2010) examined the relationship between medication adherence and demographic attributes, the perception of need, effectiveness and safety in taking anti-hypertensive medications. Demographic data included age, marital status, gender, level of education, and years of residency in the United States, years of diagnosis, the number of pills taken per day, and the frequency of anti-hypertensive medication taken per day. The inclusion criteria were self-identified Chinese-American elders aged 65 years or older with hypertension, non-institutionalized and/or independently living in the community, taking antihypertensive medications, and managing their own medications. Those who had senile dementia or Alzheimer's disease were excluded. The Hill-Bone Medication Compliance Scale was used to collect data on adherence level (Hsu et al., 2010). The researcher-developed Medication Adherence Factor Questionnaire based on Johnson's

Medication Adherence Model (Johnson, 2002) and validated by two experts was used to collect data of perception of the need, effectiveness and safety of taking anti-hypertensive medications. Descriptive statistics showed that the mean age of the participants was 75 years with the range of 65 - 90 years, female (63%), married (75%), 64% with college education and 67% of the participants with less than $20,000 annual house-hold income. The findings also showed that 52% of the participants adhered to their medication regimen. Age, gender, education, years of residency in the United States, and years of diagnosed hypertension, were not associated with medication adherence. In this study, forgetfulness, adverse effects of the medication, language difficulties, and cultural barriers were related to lower medication adherence.

The above study was conducted among elderly Chinese at church in the United States (Hsu et al., 2010). The age, gender, and education level were not associated with medication adherence in this study. This finding may be due to the traits of the study population including advanced age, high level of education and a majority being female. It was unknown, however, whether these elderly Chinese immigrants who may still carry some of the traditional Chinese values and perceptions of hypertension, were influenced by their environment and adopted culture. Problems in dealing with hypertension were likely different from Chinese people who resided in the mainland of China. The findings of contributing variables such as language difficulties and cultural barriers may not be significant variables for Chinese people residing in the mainland of China or for other younger age groups. Forgetfulness and adverse effects of the medication were similar to

findings in other populations and may suggest variables causing non-adherence of elderly Chinese people in China. This cross-sectional study with a small sample (N = 94) that targeted immigrants, 65 years or above, who were church members may not represent Chinese rural adults with hypertension.

Hsu et al. (2010) found that age, gender, education level, years of residency in the United States, years of diagnosed hypertension were not associated with adherence. However other researchers found they were associated with blood pressure control (Li et al., 2010; Wang et al., 2013). These latter findings imply a direct relationship exists between blood pressure control and age, gender and education level without adherence as a mediator. Other researchers also reported the association of demographic and health-related characteristics and blood pressure control (Li et al., 2010; H. Wang et al., 2013). The above research findings provide supportive information for the study that was conducted to examine the relationship of demographic and health-related characteristics with blood pressure control.

Self-management and Blood Pressure Control

Non-drug therapy involves a series of healthy behaviors requiring self-management. Self-management is part of treatment in chronic diseases (Fu et al., 2003). Bosworth and colleagues (2010) presented a literature review on how patient self-management was a crucial component of effective high-quality health care for hypertension and cardiovascular diseases (CVD) and how the health providers could support the individual to improve self-management .

An Asian study found evidence of a positive effect of lifestyle modification on blood pressure control was Park and colleagues' (Park, Chang, et al., 2013) self-management intervention study. The purpose of this longitudinal study was to evaluate the effects of self-management health education and individual counseling program on blood pressure, self-care, exercise efficacy, and medication adherence among Korean nursing home residents. The program aimed to promote the adherence to self-management strategies including medication adherence, diet and physical activities and stress management through group education and individual counseling. The eligibility criteria included ages 60 and older with hypertension for 12 months and longer, no cognitive function impairment, and optimal medication therapy with no change in medication for three months prior to the study. A sample of 47 Korean nursing home residents of at least 60 age (72% of whom were women) were randomly assigned to either the intervention (n = 23) or control group (n = 24). Blood pressure, self-care behavior including weight control, restrictions in dietary sodium and alcohol intake, exercise, medication, adherence, smoking cessation and stress management, exercise efficacy were measured at the beginning and eight weeks after the intervention. The sample size was justified to reach the power of 0.80 at Alpha level of 0.05. The outcomes showed that the systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly decreased eight weeks after the intervention. However, the intervention also improved self-care behavior, exercise self-efficacy, but medication adherence was not improved.

Several limitations were noticed in Park and colleagues' study (2013). First, the nursing home was the study setting, limiting generalizability. Secondly, the outcome measures were collected eight weeks after intervention, thus, the maturity validity was violated, and also the long-term effects of this self-management program remained unknown. Third, the relationship between intervention and blood pressure control was mediated by self-care behavior in the framework, but the researchers failed to test the mediating effects between the two. Fourth, the life-style modification components in the study only touched the area of decreasing salt intake, stress management, weight control, but did not address diet, exercise or other confounders such as social and family support. Fifth, the finding that medication adherence was not improved may be due to the use of a 4-item assessment tool which highly over estimate the adherence score, or possibly, the adherence rate was high before the intervention, it is unclear whether the nurses in nursing home were the ones who administered the medication. However, this Korean study provided a valuable scientific knowledge for the current study. The relationship between self-management and blood pressure in a short time period was established. However, the long-term effects deserve more comprehensive study.

As noted earlier, adherence studies usually focused on the adherence to drugs while the tools for measuring self-management behaviors were lacking (Crowley, Grubber, Olsen, & Bosworth, 2013). Also, there were relatively few studies conducted to investigate the influence of adherence to self-management on blood pressure when compared with that of medication adherence. It was also noticeable that the key

components of the self-management for hypertension were not consistent among the studies (Crowley et al., 2013; Kauric-Klein, 2012; Schmid et al., 2009). Given that previous research has failed to examine the relationship between self-management and blood pressure, it is important to conduct further investigation to explore its relationship to blood pressure.

Adherence to self-management and related variables. Adherence to self-management is a key to successful blood pressure management. Variables associated with adherence to self-management in non-Chinese studies have been reported by some researchers (Crowley et al., 2013). These include race, gender, and level of education, financial security, BMI, employment status, stress level, and accomplishment. Few Non-Chinese population studies concerning adherence to self-management were found in the literature search. In mainland China, even fewer studies were found that described the behaviors of self-management in persons with hypertension, and these studies did not measure their adherence to self-management.

Fu et al. (2003) conducted a randomized interventional study in Shanghai to evaluate the helpfulness of Chronic Disease Self-management Program (CDSMP), a well-known community based program promoting patients' self-efficacy in managing symptoms, disease in general, and promoting self-management behavior and self-rated health status. Among 430 patients with chronic diseases in the treatment group, 223 had diagnosed hypertension, and 208 out of 349 patients in controlled group were also diagnosed with hypertension. Six months after CDSMP was offered to the treatment

group. Self-efficacy, self-management behavior, and self-rated health status were measured. The CDSMP significantly improved patients' self-management behavior, self-efficacy, and self-rated health status. Nevertheless, this study did not analyze other variables that impact the adherence to self-management.

Another Chinese study (R. Wang et al., 2009) was conducted in two university-affiliated hospitals to explore variables that influenced self-care behaviors of primary hypertension patients. The cross-sectional study used two sets of questionnaires for data collection. The first gathered general information about the patient, including patients demographic data (e.g., age, gender, marital status, education level, social and family status) and patients' health condition (duration of the disease, blood pressure measures, stage of hypertension, treatment regimen, disease knowledge, and health status). The second, the Self-care Behavior Evaluation Questionnaire for hypertensive patients (SCBEQ-Hp), was created based on Orem's Self-care theory and Hanucharurnkul's self-care behavior questionnaire which demonstrated a good validity and reliability (R. Wang et al., 2009) . Trained interviewers administered the questionnaires. As a result, 126 patients completed the questionnaires. Most of the participants (71%) lived in cities and more than 70% of the participants had mild, moderate, or severe financial burdens. Also, 31% of the participants perceived no symptoms, while 47% and 21% of the participants perceived significant and less significant symptoms, respectively. Stepwise regression analysis showed that variables that influenced self-care behavior were occupation, medical payment, family relationship, co-inhabitants, and knowledge about hypertension

(R. Wang et al., 2009). Participants who were retired, medical personnel, fully insured, in better family relationships, living with others, and knew more about hypertension showed better self-care behaviors.

The aforementioned study (R. Wang et al., 2009) was conducted in mainland China and published in a Chinese Journal. The study had several drawbacks and limitations. First, Orem's Self-care Model was mentioned, but the authors failed to delineate how Orem's Self-care Model was applied to self-care behavior. Secondly, the independent variables had no theoretical support, which diminished the strength of the study design. Therefore, in the current study, an appropriate theoretical model will be used to support the causal relationships between independent variables and the study outcome.

Summary of Treatment Adherence

Adherence to medications and self-management are among the many variables associated with blood pressure. There were very few studies conducted in Chinese populations concerning adherence and blood pressure. In the mainland of China, only one study (Yu et al., 2013) reported the relationship between medication adherence and blood pressure and adherence was not the only factor that influenced blood pressure. Findings from studies in Chinese populations residing in other countries and in other Asian populations suggested that a relationship existed between blood pressure and medication adherence. The scarcity of Chinese reports on adherence and blood pressure supported the need for more sophisticated research projects to explore the relationship between

medication adherence and blood pressure in China. Furthermore, through the literature review, it was clear that adherence to self-management benefited blood pressure, but the components of self-management differed across studies. This suggests the need to find relevant self-management components for the purpose of the study that are based on current practice in China. Based on Chinese guidelines and other literature review, self-management included three dimensions of adhering to treatment recommendations: healthy diet, unhealthy diet and exercise reported by Chen et al. (2009). Indeed, the adherence related topic and blood pressure requires further investigation in mainland of China.

There were several strategies of collecting data regarding medication adherence. In general, medication adherence data collection included subjective (self-report), direct (serum or urine drug-level), and indirect (pharmacy database records, pharmacy refill rates, or pill counts) (Lee G. K. et al., 2013). Each method possesses strengths and drawbacks. Self-report methods have been widely used in medication adherence studies due to its simplicity, quick administration, and low cost. There are several self-reported tools available to collect adherence data, but Morisky's Adherence Inventory was widely used.

Illness Perception

Illness Perception and Blood Pressure

Illness perception is defined as "lay beliefs of illness" or illness perception which includes cognitive and emotional representation (Leventhal et al., 1997). Cognitive

representation involves identity (symptoms experienced), cause (causal attributions), timeline (duration of the illness), timeline cyclical (predictability of the illness), consequences (impact of illness on one's life), and curability/controllability (whether the disease is controllable). Leventhal et al. (1997) suggested that coping mediated the effect of illness representation on illness outcomes (Dela Cruz & Galang, 2008). Outcomes in the Self-regulation Model include disease state, physical functioning, psychological functioning (distress or well-being), role functioning, social functioning and vitality. These six classifications of the illness outcomes were proposed by Leventhal, Nerenz, and Steel (1984) and supported by Hagger and Orbell (2003). Blood pressure control in hypertension management was the clinical outcome which belonged to the category of disease state as described by Leventhal et al. (1997). Consequently, this literature review focuses on studies of illness perception and disease state. Related studies on different chronic diseases such as Type 2 diabetes, and advanced gastrointestinal cancers, have reported the predictive values of illness perception on the disease state, which were defined as the condition or by clinical values (Gosse, 2007; Z. Sun et al., 2010). For example, Gosse found that cure control and emotional representation were predictive of better glycemic control in a sample of Type 2 female diabetic patients in the United States. Daily self-monitoring of blood glucose was also predictive of better glycemic control and 7% of the variance in HgbA1C. A higher number of co-morbidities predicted less glycemic control. In contrast to Gosse's finding that illness perception predicted the outcome of the disease, Cherrington, Lawson, and Clark (2006) reported that illness

representation was not associated with the severity of left ventricular dysfunction. Another study examining illness perception and treatment adherence rates in patients on maintenance hemodialysis (HD) was conducted to determine if illness perceptions and adherence behaviors influenced clinical outcomes (Kim & Evangelista, 2010). The results demonstrated that illness perception alone did predict any clinical outcomes in patients on maintenance HD. Given the contrasting findings from these aforementioned four studies, it appeared that the predictive value of the illness perception differed across chronic diseases. No studies of Chinese population in China or other countries reported the predicative value of illness perception on clinical outcomes. This gap provides strong support for the current study.

Illness Perception and Adherence

Three studies provide evidence that suggests if patients did not perceive symptoms, they were less likely to perceive they had an illness and adhere to treatment recommendations (Hsu et al., 2010; Johnson, 2002; Yu et al., 2013). Of particular importance to this study were the findings of Yu et al. (2013) who evaluated the effectiveness of an anti-hypertension subsidy program on medication adherence, medication costs, and blood pressure. Two matched samples (n =105 in the interventional and control groups) were compared with the conclusion that adherence was greatly improved in the intervention group. In addition to the above finding, Yu and colleagues (2013) further analyzed the reason for poor adherence. "Not feeling sick" was a common variable influencing medication adherence in both groups. The findings of "Not feeling

sick" associated with low medication adherence were consistent with Johnson (2002). Chinese people may not view hypertension as a disease because they view health as being free from symptoms. Many times hypertension does not present any symptoms in the early stage, which may lead to non-adherence to medication. This is because taking medication is based on the presence of symptoms (Hsu et al., 2010). A qualitative study conducted in Canada by Prouxl and colleagues (Proulx, Leduc, Vandelac, Gregoire, & Collin, 2007) showed that perception of one's health status, specifically the feeling of vulnerability in the face of a hypertensive condition, influenced his or her medication behavior. Therefore, patients' perception of health and illness may play a vital role in medication adherence. However, the findings of this Chinese study (Yu et al., 2013) should be viewed with caution due to several limitations including small sample size and heterogeneity between the two groups. "Not feeling sick," just like the perceived symptom of illness perception described by Leventhal et al., (1997) interferes with patients' medication adherence (Yu et al., 2013).

Lower perceived susceptibility to specific diseases has been found to be associated with lower adherence. A research project (Li et al., 2012) was conducted in a large Taiwanese tertiary hospital (6,800 beds) to examine the non-adherence rate to anti-hypertensive medication and the association of cultural and clinical variables with adherence. Data were collected from a convenience sample of 200 hypertensive patients aged 18 and above with hypertension diagnosed by a physician, with no known severe complications, no cognitive or mental impairment, who were currently taking anti-

hypertensive drugs and who had visited the clinic at least once in the prior year. Independent variables including health perceptions, social support, and demographic data were collected by self-administered questionnaires that included seven Likert scales. Health perceptions included perceived susceptibility to specific disease, perceived susceptibility in general, and perceived benefits. Clinical variables such as number of prescribed antihypertensive medications, previous and current regimen for hypertension, complications, and family history were collected by reviewing medical charts. Another clinical variable, the length of hypertension diagnosis, was reported by patients. The dependent variable, medication adherence, was measured with Modified Morisky's Medication Adherence. Blood pressure was measured twice with at least a two-minute interval. An average value of two readings was taken for the data analysis. Logistic regression was applied to analyze the predictive value of the eight cultural variables for none-adherence. The findings of the study showed almost half of the participants had BP controlled, and about 47% of total participants adhered to a medication regimen. Lower perceived susceptibility to specific disease and longer length of HTN diagnosis were associated with none-adherence.

Several limitations were noted in Li and colleagues' study (2012). First, the participants were recruited in the clinic, which suggested that the study population was unique with their willingness to adhere to clinic follow-ups. In fact, of 335 patients contacted, 135 patients refused to participate in the study. The rate of adherence to medication may have been relatively higher than that of all patients or the population in

multiple settings. This bias might affect the results of this study. Secondly, the authors could have described clearer the relationship of the theoretical concepts with operationalized measures in the study. In particular, the eight cultural variables were not explained in an explicit way. It appeared that the cultural variables served as a general name for all the data collected in the data collection section. Third, the cross-sectional study was not able to establish a causal relationship of the variables to hypertension. Finally, the concept of health perception referred to the self-perceived health status, which was different from the concept of illness perception in the Common-Sense Model (Leventhal et al., 1997). The findings of the above study may not be applicable to the current study due to a different population and a different illness perception concept. On the other hand, the findings of lower susceptibility to specific diseases was informative to the current study as it provided support for a relationship between individual's perception and adherence to medication.

Some studies have investigated the relationship between illness perception and medication adherence (Dela Cruz & Galang, 2008; Figueiras, Cortes, Marcelino, & Weinman, 2010; Hagger & Orbell, 2003; Ross, Walker, & MacLeod, 2004), but very few studies analyzed the relationship of illness perceptions with adherence to medication and self-management at the same time. S. L. Chen et al. (2011) conducted a cross-sectional, correlational study to test a hypothetical model of the relationship between illness perception and adherence to both medication and self-management recommendations based on Leventhal's Common-Sense Model. All of the 355 participants were patients

with a 10-year history of HTN visiting one of three cardiovascular clinics in teaching hospitals in central Taiwan. Illness perception was measured using the Illness Perception Questionnaire-Revised (IPQ-R) that was modified for Chinese culture and language and demonstrated good reliability and validity. The Inventory of Adherence to Medication and Inventory of Adherence to Self-management were developed for the study. Confirmatory factor analysis was conducted to test the model for latent constructs and structural equation modeling (SEM) was used to test the study hypothesis. The study hypothesis was that direct relationships existed among three components of illness perception (identity, cause, and control) and adherence. Age, systolic blood pressure, number of antihypertensive medications, and comorbidities were treated as confounders. However, the outcomes indicated that illness identity, directly or indirectly (through cause and control) affected adherence. Control of disease showed direct effects on adherence to both medication and self-management. The result also indicated that cause of illness only had direct effects on adherence to medication. Individuals who experienced more symptoms tended to seek more causal attributions of the illness, perceived the illness to be more negative and less controllable, which ultimately led to low adherence rates to prescribed medications and self-management behaviors.

In summary, S. L. Chen et al. (2011) recommended that a possible effective way to improve adherence was to increase patient's personal and treatment control. Thus, illness perception should be a target variable for interventions to enhance adherence. The results of this comprehensive study could not demonstrate the dynamic process of self-

regulation due to its cross-sectional design. Surprisingly, the overall effects of negative illness representation were not related to patient adherence. This suggested that illness perception and adherence could be two separate variables influencing blood pressure. Moreover, purposive sampling may affect the generalizability of the findings. In this study, illness identity was the key concept tested and analyzed in illness perception. The study findings of S. L. Chen et al. (2011) suggested that the five components of illness perception have differing effects on adherence and that relationships also existed among the components. The findings indicated a need to explore possible relationships among the five components of illness perception and the relationship between each component of illness perception and adherence to medication or/and to self-management.

In Chen and colleagues' earlier study (2009), 277 hypertensive Chinese patients in a Taiwan cardiac unit were studied to assess the influence of illness perception on adherence to drug therapy and self-management. The inclusion criteria were patients aged 18 years and above with essential hypertension diagnosed by a cardiovascular physician and who had been taking prescribed antihypertensive drugs for hypertension for at least three months prior to beginning the study. Patients who were medically unstable, with any critical or acute episodes, or non-essential hypertension were excluded. The validated Chinese version of Illness Perception Questionnaire-Revised for hypertension was used to collect the data. Additionally, the Medication Adherence Inventory (MAI) and Inventory of Adherence to Self-management (IASM), developed and tested by the authors with results supporting good reliability and validity, were administered to collect

the adherence data. The findings showed that the adherence rate was 83%. The control component (treatment control and personal control) of illness perception were positively associated with most of the adherence scores. The patients who believed in the treatment regimen and were self-confident were more likely to get higher adherence scores. Timeline cyclical and consequences were negatively associated with most subscales of the MAI, while coherence, timeline, balance attribution and risk variables were significantly related to most subscales of the IASM. The strongest correlation was found between the score of IASM and personal control. Hierarchical regression was used to test the predictive value of the variables for adherence. Patients who lived with others or were hyperlipidemic were more likely to report higher adherence scores than others. Three components of illness perception including treatment control, psychological variables and risk variables demonstrated a significant predictive value for medication adherence. This finding was supported by Ross et al. (2004). Older patients with a longer history of hypertension and who were better educated were more likely to adhere to self-management. After controlling for age, history of hypertension and education level, presentation of symptoms related to hypertension, uncertainty about symptoms, personal control, balance attribution, and cultural attribution were found to be predictive of self-management.

Chen's study presented some different findings when compared to other similar studies (Chen et al., 2009). For example, risk variables and psychological attributions were significantly predictive of medication adherence, which was different from those in

other studies. Furthermore, symptoms, personal control, balance and cultural attributions were the predictors of self-management.

However, the S. L. Chen et al. (2009) study was conducted in a cardiovascular clinic with patients who had been visiting the clinic for 10 years, thus demonstrating a high adherence rate to follow-up care. We could infer that those patients may more closely adhere to the treatment regimen. Plus, a convenience sampling may not be generalizable to other hypertensive population. Self-report of the adherence rate and non-disease specific IPQ-R weaken the reliability of the study findings. The cross-sectional study provided information of the relationship between illness perception and adherence to both medication and self-management plan.

In contrast, one non-Chinese population study demonstrated opposite findings to the previous studies. This cross-sectional study (Vaeth & Willett, 2011) used the data from a population-based study of cardiovascular disease which had 6,101 people, of which, 656 people had hypertension. Self-reporting on BP measure was collected. Illness perception including belief in effectiveness of lifestyle modification for treating hypertension, the inevitability and permanence of hypertension and accompanying symptoms were rated. The findings showed the association between illness perception and blood pressure self-measurement (blood pressure monitoring), but the association disappeared in logistic regression analysis after controlling for other variables.

There were several limitations in this study design (Vaeth & Willett, 2011). First, all data were collected using a self-reporting approach, minimizing the validity of the

data. However, these data were from a large community survey, enhancing the generalizability of the study. Unfortunately, illness perception was measured by asking the participants three questions about whether "lifestyle modifications are effective," "hypertension is inevitable and permanent," and whether their hypertension was accompanied by symptoms. The components of illness perception described by Vaeth and Willett (2011) were quite different from illness perception in the Common-Sense Model. The findings of this particular study could be taken as a reminder that more comprehensive studies were required to test the association between illness perception and adherence in different cultural contexts and populations.

Illness Perception and Related Variables

No specific studies were found that examined the relationship of illness perceptions and hypertension in mainland China. According to Leventhal et al. (1984), illness perception tended to be obtained from environmental stimulus, perceptual stimulus and social communication. Many non-Chinese population studies supported the theory of Leventhal and colleagues. Demographics such as gender, employment status, and living arrangement (S. L. Chen et al., 2011; Lau-Walker, 2006, 2007; Pickett et al., 2014; Scisney-Matlock, Watkins, & Colling, 2001), illness characteristics (Lau-Walker, 2006), cultural variations (Ford, Zapka, Gebregziabher, Yang, & Sterba, 2010; Y. Kim, Pavlish, Evangelista, Kopple, & Phillips, 2012; Rudell, Bhui, & Priebe, 2009), symptoms (S. L. Chen et al., 2011; S. L. Chen et al., 2009), past experiences of the disease (Fowler & Bass, 2006; Lau-Walker, Cowie, & Roughton, 2009; Lau-Walker,

2006), and self-efficacy (Lau-Walker, 2007; Schuz, Wurm, Warner, & Ziegelmann, 2012) were all variables associated with illness perception.

Illness perception was used as one of the independent variables in predicting blood pressure in the current study. Other relevant variables pertinent to a discussion of illness perception need to be studied and examined closely. Demographic data and illness characteristics were found to be associated with illness perception of the patients. Lau-Walker (2006) conducted a longitudinal study of 300 coronary heart diseases patients admitted to hospital to assess the measures of illness representation components in predicting measures of self-efficacy. However, while conducting the investigation to describe relationship of illness perception to self-efficacy, Lau-Walker (2006) examined the effects of demographic data and illness characteristics on illness perception. The Illness Perception Questionnaire -Revised (IPQ-R) was used to identify the illness perception and Generalized Self-Efficacy Scale along with cardiac diet and exercise self-efficacy instruments were used to measure general self-efficacy and specific self-efficacy for diet and exercise. All four tools were reported to have good reliability and validity. The demographic data and illness characteristics along with four dependent variables (illness perception, general efficacy and efficacy of exercise and diet) were collected at the beginning (baseline data) and nine months after the first data were collected. Baseline data analysis showed strong effects of demographic (gender, employment status, living on their own) and illness (history of cardiac problem, route of entree to health care) characteristics on illness perception. Female patients were more likely to identify and

perceive more symptoms than males. Patients who lived with others demonstrated stronger beliefs in the effects of exercise on recovery. Patients with first time heart problems and employed patients sensed more control than others. Patients with a first time heart problem tended to have a higher sense of control, perceive fewer symptoms and view their condition to be short term. Individuals' demographic (gender, employment status, living on their own) and illness characteristics (history of cardiac problem, route of hospital admission) are influential to patients' perception of the nature of their illness.

The findings of this study (Lau-Walker, 2006) suggested that certain demographic data and illness characteristics affected illness perception in the long term. This conclusion may not be applicable to patients with hypertension. The nature and the characteristics of hypertension are different from coronary disease. For example, hypertension is more asymptomatic than coronary disease. The variables associated with illness perception found in this study may be different from those of hypertension. Furthermore, the gender variable which was associated with illness perception in this study may be not reliable since there were significantly more male participants (n = 195 vs. n = 53). Thus, the demographic and illness characteristics may not be associated with illness perception.

In addition, this study also indicated that illness perceptions changed as patients experienced fewer symptoms. In fact, symptom was one of the important variables related to illness perception. According to Leventhal et al. (1997), symptoms and labels were significant in the development of illness representation and was supported by Rudell

et al. (2009). Chen et al. (2009) reported that 43.7% of 277 Taiwanese hypertensive patients experiencing symptoms after diagnosis and 38% of the total sample predicted their blood pressure by symptom presentation. In another study, Chen et al. (2011) found that patients experiencing more symptoms of hypertension identified more causal attribution and developed negative feelings toward illness. This additional finding showed the existence of correlation between the symptoms and illness representation and causal attribution.

Cultural variation was also found to be related to a person's illness perception. Studies have shown that illness perception varies in different cultural contexts and among different individuals (Rudell et al., 2009). One study explored the variables associated with illness perception among 23 critically ill patients in the medical intensive care unit and 77 surrogates who were decision-makers. Among all independent variables including age, gender, level of education, length of stay in ICU, surrogate decision- maker, race, religion faith, and perceived pre-critical illness quality of life (QOL); race, religion faith, surrogate decision-maker, and perceived pre-critical illness QOL directly influenced illness perception of African Americans (Ford et al., 2010). This study suggested that African Americans had a tendency to perceive the illness as less enduring, less serious, having less emotional influence and showed more confidence in treatment efficacy and greater personal control (Ford et al., 2010). Although this study was not conducted with a hypertensive population and had a relative small sample size, it did provide valuable information about illness perception of critically ill patients and surrogates and the

determinants of illness perception. With a long history and unique culture, Chinese patients had different causal explanations and self-diagnosis symptom attributions before seeking help. For example, some patients viewed hypertension as too much fire in the body. Therefore, the current study is meaningful as it examines the illness perception of hypertensive patients in mainland China where cultural perceptions differ from other places.

Summary of Illness Perception Related Studies

The literature review on illness perception related studies indicate that no studies have explored the association between illness perception and blood pressure. The literature review also suggested that multiple variables influence the treatment adherence. The association between illness perception and treatment adherence were explored in other countries and in the Chinese population in Taiwan and other countries, but the cross-sectional studies failed to provide a causal relationship between the two variables. In addition, most of the illness perception studies referred to illness perception as it was described by Leventhal et al. (1984).

Studies of illness perception of hypertension and adherence have been scarce. Except for two reports from Taiwan (Chen et al., 2011; Chen et al., 2009), there was no literature available to report similar studies in mainland China, leading to the incentive for professionals to conduct Chinese population focused studies. The current study does not attempt to determine the relationship between illness perception and adherence, but

rather treats illness perception and adherence as two separate predicators of blood pressure.

Summary of Literature Review

This literature review has discussed hypertension management CPGs, as well as research findings relevant to medication adherence, hypertension self-management, and illness perception. Influencing factors, particularly culture, have received close attention. These findings will now be summarized. First, CPGs including Chinese CPG, all indicated that hypertension management should involve both antihypertensive drug and self-management behaviors (AI-Ansary et al., 2013; L. S. Liu, 2011). Five classes of antihypertensive medications were commonly prescribed in the treatment of hypertension. These five classes of medications could be either in single or combined form. Chinese rural adults usually take Beijing Anti-hypertensive No.0 agent, a compound of several drugs, to control their blood pressure with blood pressure control reported as optimal (N. L. Sun et al., 2012; Tan et al., 2006). In addition to the recommended medications, Chinese rural adults also tended to take herbal drugs or other alternatives such as acupuncture or Qigong, etc.(Shen et al., 2010; Tong et al., 2012). In the current study, data on medication perspectives includes alternative therapies.

Self-management is also a very important regimen for hypertension control. The Chinese guidelines indicated that self-management involves healthy diet, and exercise. No Chinese literature reported how those self-management behaviors were practiced among rural adults with hypertension.

Secondly, the influencing variables on blood pressure control were numerous, but among those variables, adherence to medication and self-management were primary variables of blood pressure control. The variables influencing medication adherence found in Chinese population included forgetfulness, depression, medication adverse effects, cultural variables (Hsu et al., 2010), and poor socioeconomic status or financial problems (Wong, Jiang, & Griffiths, 2011; Yu et al., 2013). Additionally, illness perception was found in the literature to be correlated with medication or self-management adherence, but the causal relationship has not yet been established. Medication adherence was measured using both self-report and pill counting approaches. There are several self-report tools currently available, but Morisky's Adherence Scale has been most commonly used in the literature. For the measure of adherence to self-management, each study reported different components of self-management for hypertension. Moreover, there were no relevant studies in China to explore the variables influencing self-management. Most of the studies on adherence to self-management were to evaluate the efficacy of self-management programs on adherence to self-management. Nevertheless, most studies reviewed were cross-sectional and causality could not be inferred.

Thirdly, there was a lack of sufficient scientific evidence on illness perceptions toward hypertension. Neither was there evidence of which variables might affect illness perceptions among Chinese patients with hypertension. A few studies conducted in other countries and Taiwan showed the effects of specific illness perception on adherence to

medication and self-management (S. L. Chen et al., 2011; S. L. Chen et al., 2009; Li et al., 2012; Yu et al., 2013). In contrast, Vaeth and Willett (2011) reported the relationship between illness perception and self-management disappeared in logistic regression analysis after controlling for other variables. This study does not test the association between illness perception and adherence, but treats illness perception, adherence to medication and self-management, and demographic and health-related characteristics as independent variables predicting blood pressure control. Illness perception has been reported previously to be associated with clinical outcomes in the studies of other chronic diseases (Z. Sun et al., 2010). None were found that examined how illness perception was related to blood pressure control. Even though variables influencing illness perceptions were found in several studies, no systematic studies have been conducted specifically to fully explore them, especially among patients with hypertension in mainland China.

Finally, the relationship between illness perception and blood pressure control was not found in the literature. Therefore, the current research is needed to investigate the influence of illness perception on blood pressure control among Chinese rural adults with hypertension. In addition, demographic and health-related characteristics were not associated with adherence and illness perception in some studies, but were related to blood pressure control. Thus, this study examines demographic and health-related characteristics, treatment adherence, and illness perception as separate variables in the prediction of blood pressure control.

The Theoretical Framework

Review of Relevant Theory

The Illness Representation Theory was based on Leventhal's Self-Regulation Model (SRM). Leventhal used the Common-sense Model (CSM) in the 1960's to explain the coping strategies that individuals use when facing illness. Later in 1984, Leventhal and colleagues modified the CSM and started their SRM to describe how individual beliefs affect their coping and appraisal processes to adjust illness representation (Leventhal et al., 1984). SRM consists of three phases. In the first phase, individuals hold a cognitive and an emotional representation of illness when facing the presence of illness.

According to Leventhal, illness representations are formed based on personal traits and illness characteristics. In the second phase, problem-based and emotion-focused coping response is made to cope with the challenges. Finally, in the third phase, a continual appraisal of their own behavior and physical response is made in order to change the illness representations leading to a self-regulated coping response. Theoretical Framework is displayed in the following Figure 1.

There are five elements in cognitive representations, namely, identity, cause, timeline, consequences, and curability/controllability. Identity is the individual's perception of what the problems are, and is affected by illness symptoms, past experiences, and cultural background. According to Leventhal et al. (1997), when an individual is given a diagnosis (label), he or she will look for matching symptoms and interpret their own health problems. Identity is formed. The second component of illness

representation, cause, reflects individual's opinions of what might cause the illness. A group of researchers (Lin, Chang, & Wu, 1998) summarized some possible causes that individuals might use to explain their illness such as biological variables (e.g. virus infection, heredity, etc.), psychosocial variables (e.g. stress, personal traits, etc.), environmental variables (pollution, lifestyle, food habit) and others. For example, some believe that sins cause the consequence of illness. Timeline is the individual's belief on how long it takes to cure the illness, whether it is acute or chronic. Some Chinese people deny the chronic nature of hypertension. This denial can be demonstrated by discontinuing medication when the blood pressure is normal. Consequence refers to individual's beliefs regarding the prognosis of hypertension. Some people in China think hypertension is normal in aging and that there will not be any consequence. Curability and/or controllability are beliefs individuals hold toward illness. Interestingly, these five elements are interrelated and affect each other. For example, if a patient perceives the illness to have a severe consequence, the curability and controllability are relatively low (Fowler & Bass, 2006). Researchers (Hagger & Orbell, 2003) have reported a negative correlation between curability/controllability and timelines. The cognitive and emotional representations work together to produce coping mechanisms; these coping mechanisms are also affected by many variables. Adherence or non-adherence is the coping behavior. Many studies have shown the relationship between each element of cognitive and emotional representations with coping behaviors (Fowler & Bass, 2006; Hagger & Orbell, 2003; Moss-Morris, Petrie, & Weinman, 1996).

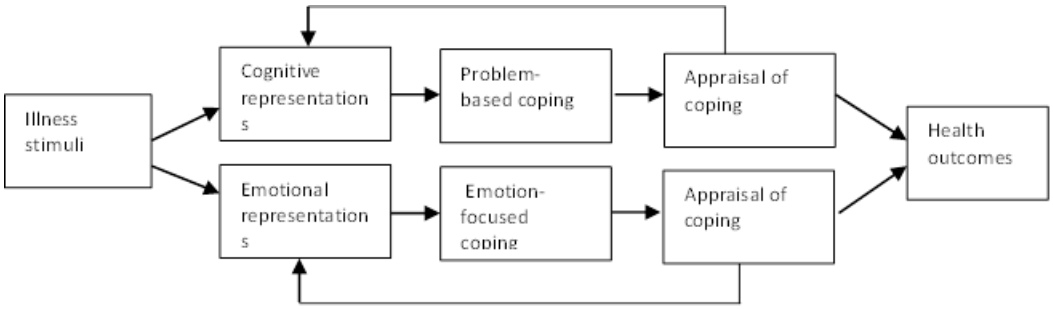

Figure 1. Theoretical framework. Adapted from "A Meta-Analytic Review of the Common-Sense Model of Illness representations," by M. S. Hagger & S. Orbell, 2003,*Psychology & Health, 18*(2), p. 144. Copyright 2003 by Routledge. Adapted with permission from the author.

Later, Moss-Morris et al. (2002) added timeline cyclical (the variations of the disease), illness coherence (the extent of patients' understanding of their diseases) to describe illness perception and reorganize the concepts into three constructs, namely, illness representation, identity, and cause. Illness representation includes timeline, timeline cyclical, illness coherence, consequences, personal control, treatment control, and cure/curability (Moss-Morris et al., 2002). When the concept of illness perception was applied in a Chinese study in Taiwan (S. L. Chen et al., 2011), confirmatory factor analysis was conducted and found that a higher order exist among the seven variables of illness representation, therefore, four variables – timeline, control, negative IR, and illness coherence were derived from original seven variables. Negative IR included consequence, emotional representation, and timeline cyclical, and control involved treatment and personal control. The identity component includes the symptoms experienced and symptoms used to predict hypertension. The cause component, includes psychology, risk factors, immunity, and accident/chance (Moss-Morris, Weinman, J, et al., 2002).

Research Model for Study

Based on the above analysis of the SRM, the research model for the proposed study was established with modified variables for hypertension. Specifically, the cause component was adjusted by replacing immunity and accident with balance, and cultural attributions due to the nature of the diagnosis. The model is displayed in Figure 2.

Theoretical Rationale for Model

The SRM is a valuable framework for understanding and explaining adherence to treatment in various illnesses such as coronary disease, chronic kidney disease as well as hypertension (S. L. Chen et al., 2009; Fowler & Bass, 2006; Lau-Walker et al., 2009). Based on SRM, human beings choose their health care behaviors through cognitive and emotional responses to the illness. These cognitive and emotional responses are affected by the characteristics of the illness and personal traits. Adherence to medication and self-management activities are considered health care behaviors. Most of the studies in the literature evaluated the relationship between illness perceptions and adherence by treating adherence as a dependent variable. This model extends research to investigate the effect of illness perceptions on blood pressure control.

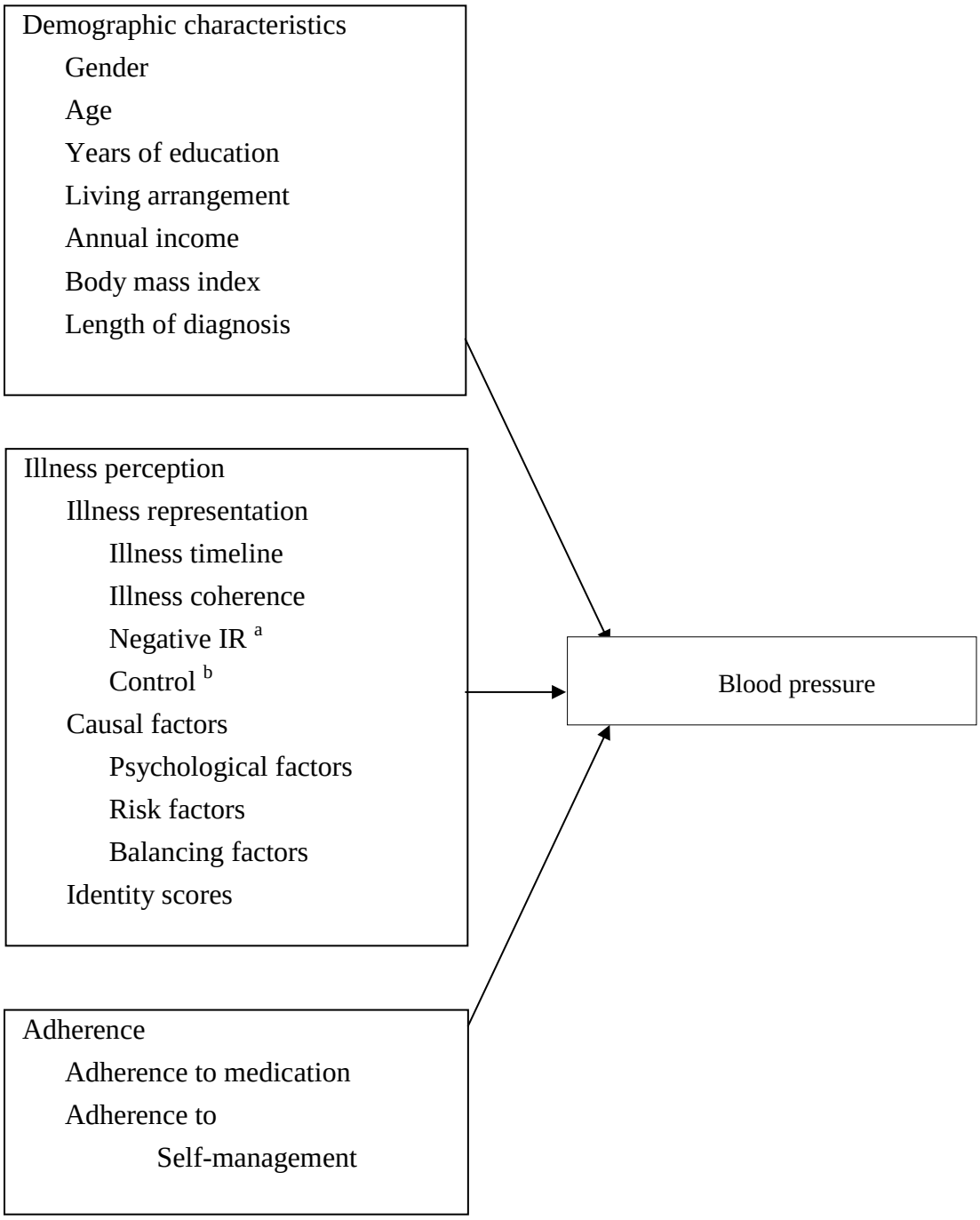

Figure 2. Research model for the study

[a] Negative IR: stands for negative illness representation including illness cyclical, emotional response, and consequence.

[b] Control: treatment and personal control.

Summary of the Model

Critical evaluation of Leventhal's SRM has demonstrated its value in the illness perception studies in Chinese population by S. L. Chen et al. (2011). The research model of this study was based on SRM to evaluate illness perceptions in terms of cognitive and emotional representation of illness. Six variables including identity, cause, timeline, control, and negative IR are examined to find the relationship with each other and with adherence as well as with the outcome of blood pressure control.

Summary of Chapter Two

Relevant literature was critically reviewed in Chapter Two. The findings of the literature review indicated gaps in existing knowledge indicating need for future studies. In general, no literature was found that reported relevant studies on illness perception in the mainland of China based on the SRM (Leventhal et al., 1997). The CPGs for hypertension management indicated both drug and non-drug therapies are required for effective blood pressure control. Chinese rural adults use some alternative therapies either by physicians' prescription or by self-medication. In the current study, it was necessary to find out whether the participants are using the alternative therapies because these therapies may interfere with the clinical outcomes of hypertension management.

Demographic and health-related characteristics, adherence to medication and self-management, illness perception, and comorbid chronic diseases such as coronary heart disease and diabetes all influence blood pressure control. Among variables influencing blood pressure control, adherence to medication and self-management were keys to

successful clinical outcomes. The influential effects of high adherence to medication on better blood pressure control were found when the medication itself is effective. Medication adherence data is commonly collected with Morisky's Medication Adherence Questionnaires in the literature. The Inventory of Adherence to Self-Management developed by S. L. Chen et al. (2011), which was congruent with Chinese CPGs, encompasses healthy diet, unhealthy diet, and exercise.

This study did not investigate the relationship between illness perception and adherence to medication or self-management, but rather treated illness perception and adherence as two independent variables. Furthermore, illness perception related factors vary such as demographics including gender, living alone and employment status, illness characteristics, cultural variations, symptoms, past experience, and self-efficacy. These variables can serve as independent variables in future studies to find out what variables predict people's illness perception.

The SRM was reviewed and analyzed to discuss its value for the current study. The original five components of Illness Representation theory were delineated and explored as to how they evolved to seven components and can be used as four components (timeline, control, negative IR, and illness coherence). The research model for the current study was developed based on the literature review and SRM. Demographic and health-related characteristics, illness perception, and adherence to medication and self-management are the independent variables for the current study, while blood pressure is the outcome variable.

CHAPTER THREE

METHODS

Hypertension is becoming increasingly prevalent in China as is concern about the lack of appropriate hypertension control. This study sought to examine the relationship of demographic characteristics, illness perception, and adherence with blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. In this chapter the research design, underlying assumptions, proposed research questions, and study methods--including sampling plan and analysis strategies, are described.

Research Design

A cross-sectional, correlational, descriptive research design was used to achieve the purpose of this study. This design allows use of methods for examining and measuring relationships among the study variables. The variables in the current study include demographic and health-related characteristics of rural hypertensive adults in China, their perception of illness, their adherence to medication and self-management, and their blood pressure.

Assumptions

Philosophical Assumptions

Post-positivism provided philosophical support for this research design, for it indicated that human knowledge was based on changeable, human conjectures and justified by a set of warrants. Karl Popper, a commonly recognized first thinker of post-positivism, argued that knowledge should be falsifiable and can be revised by further

observation. According to post-positivism truth can be inquired only imperfectly and human beings only could get closer to the approximation of the truth (William, 2006). The goal of research in the guidance of post-positivism paradigm is to explain, predict, and control and be involved in making generalizations and cause-effect linkages. As in positivism, the need for rigor, precision, logical reasoning and attention to evidence is required, but unlike positivism, this is not confined to what could be physically observed. Unobservable phenomena have existence and can be used to explain function. Inquiry through multiple methods may be conducted in natural settings, and situational information is recognized as data. With this epistemological strength, a post-positivism approach considers the nature of nursing which is a humanistic labor and requires sensory data collection to find the approximate truth (Clark, 1998), and yet, this approach enables the researcher to retain some strength of the positivism approach in scientific research. However, post-positivist approaches not only assume that reality existed, and is mentally constructed by individuals, it also accepts that theories, background, knowledge and values of the researcher can influence what is observed. It does not exclude the unobservable data, therefore, encompasses both objective and subjective data. Self-reports inherent in interviews or questionnaires can be quantified for analysis. Illness perception is a subjective concept; it is unobservable. To understand subjective and emotional perceptions toward an illness, collecting self-report data is necessary. With post-positivism approaches, study results can be justified to be a reality, or some aspect of the reality.

Assumptions for the Current Study

The current study was based on following assumptions:

1. Rural hypertensive patients in China develop a unique illness perception due to different cultural and traditional backgrounds.
2. Illness perception is a major factor influencing health outcomes.
3. All hypertensive patients at the study site have received basic knowledge about hypertension management.
4. Chinese rural adults value their health.
5. Chinese rural adults with hypertension are interested in controlling their hypertension.
6. High blood pressure is detrimental to health and well-being;
7. High adherence to medication and self-management is a factor influencing blood pressure.
8. Medication is an effective treatment for hypertension among Chinese rural adults.
9. Prescribed medications for the control of hypertension are in the best interest of individuals with hypertension.
10. Chinese rural adults are also interested in self-management activities in maintaining blood pressure in normal range.

Research Aims and Questions

Research Aims

The purpose of this study was to examine the relationship among demographic and health-related characteristics, illness perception, and adherence (adherence to

medication and adherence to self-management) and blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. This study aimed to:

1. Describe the demographic and health-related characteristics, levels of illness perception, medication and self-management adherence, and SBP and DBP in the study sample.

2. Examine the association between demographic and health-related characteristics and blood pressure.

3. Examine the relationship between illness perception and blood pressure.

4. Examine the relationships of adherence to medication and adherence to self-management with blood pressure.

5. Determine how well the demographic and health-related characteristics, illness perception, and medication and self-management adherence predicts blood pressure.

Research Questions

Aim One

1. Using appropriate descriptive analyses, what were the demographic and health-related characteristics of the study participants?

2. What were the summed subscale and total scores for measures of illness perception, medication adherence and self-management, and SBP and DBP in this study sample of hypertensive rural adults living in mainland of China?

3. What were the demographic and health-related characteristics associated with illness perception?

4. Did an intercorrelation exist among all variables of illness perception?

Aim Two

1. What was the relationship of each demographic and health-related characteristics with BP?

2. What demographic and health-related characteristics predicted BP in this study sample?

Aim Three

1. What was the structure validity of causal subscale of illness perception?

2. What was the relationship of each subscale of illness perception with SBP and DBP?

3. Which scales of illness perception predicted SBP and DBP in this study sample?

Aim Four

1. What was the relationship of the measures of adherence to medication and adherence to self-management with SBP and DBP?

2. How did medication and self-management adherence predict SBP and DBP in this study sample?

Aim Five

1. What was the strongest prediction model among demographic and health-related characteristics, illness perception, and adherence for blood pressure in hypertensive adults in rural China.

Sample

Participants for this study were recruited from two villages in Zhejiang Province, China. Zhejiang province is one of the most developed and richest regions with about 54 million people in Southern China, of which 38.38% of people live in the countryside . A survey carried out in 2010 showed that the overall prevalence of hypertension in Zhejiang province was 30%, an increase of 14% compared with findings from a 2002 National Survey (H. Wang et al., 2013). The health database of a local health care center showed that 3,200 people live in one of the two villages and 1,308 in another one. Among those people, 175 adults were diagnosed with hypertension in first village and 148 in the other one. There were 62 hypertensive patients with concomitant diseases or complications such as diabetes mellitus and coronary disease. The reasons for choosing these villages as study sites were threefold. First, the prevalence of hypertension reported by the local health care center was high. Secondly, health education programs were conducted three times by the Zhejiang Nursing Association to introduce antihypertensive drug therapy and self-management to all hypertensive adults in these two villages. Finally, individual health files were created and kept in the health care center in the village.

A sample size of 161 was sought to achieve 80% power to detect an *R*-Squared of 0.10 attributed to 14 independent variables using an *F*-test with a significance level (alpha) of 0.05. The variables tested were adjusted for an additional 13 independent variables with an *R*-Squared of 0.10 (Cohen, 1988).

The basic inclusion criteria include: (a) adults 18 years and older, (b) diagnosis of hypertension (HPN) for a minimum of three years (systolic blood pressure ≥140mmHg or diastolic blood pressure ≥ 90mmHg), (c) living in the area of two selected villages, (d)

currently receiving (or have received) medication treatment and recommendation of self-management activities, and (e) able to respond to survey questions either by reading, writing or verbally. Exclusion criteria were patients with any other significant chronic physical comorbidities that involve pharmacologial therapy. All hypertensive adults in the villages who met the above criteria were invited to participate in the study.

Protection of Human Subjects

Permission to conduct the study in the two villages, access the personal health files, and assign a coordinator to support the data collection in the health center, were solicited from the director of health department in the County. A letter of support from the local government that supported the investigation of the current study was obtained (see appendix A). Another letter which supported the cultural approriateness from a nurse administrator affiliated with the local Chinese university who served as a IRB local contact for the study was also solicited (see appendix B). The permission to conduct the study and above-mentioned two letters were submitted along with the LLU IRB application. Approval from the Loma Linda University (LLU) Institutional Review Board (IRB) to conduct the study with a waiver of signed informed consent was granted (see appendix C).

The selected participants were provided with a brief introduction to the study over the telephone (see Appendix D) and an appointment was made. Before data collection, the participants were allowed to further explore the information about the study which was written on the cover page of the questionnaires. The cover page included a description of the study: the purpose and what their participation would entail, the risks and benefits to them if they agreed to participate in the study, their right to refuse, and

methods to be used to maintain confidentiality (see appendix E). There was minimal risk to the individuals for participating in this project. It was acknowledged that some individuals may feel uncomfortable while being asked to answer the questions about their experiences. Participants were allowed to ask questions, or decline if they did not wish to answer a specific question. This research may not directly benefit the participants, but may help the participants to understand their health status and promote the awareness of hypertension.

Data collected, did not contain personal identifying information. The log with name and contact information were on a separate form from the survey questionnaires. The survey questionniares and log were kept in separated locked files. The survey data was entered into SPSS version 21for data management and statistical analysis. The digital data files were kept in a password protected computer file. No personal identifying information was included in this file. The de-identified stored data were used for the analysis.

Procedures

Participant Recruitment and Data Collection

Once IRB permision to conduct the proposed study was obtained, the student investigator (SI) visited the local authority for the selected villages to request for permission of the investigation . Then the SI sought permission and assistance from the village health center to conduct an initial review of the personal health files of potential participants. The SI reviewed the health files. A name list of the eligible participants

based on the inclusion criteria was made. At the same time, the general information such as home address, telephone number, age, gender, living arrangement, employment status, and length of diagnosis were collected when reviewing the health file. A telephone call was made by the SI to further explain the study and enroll them. An appointment was made to meet them in the health center for data collection. Oral informed consent was obtained before data collection. The data obtained from the health file was validated with the participants for any updates.

Three validated questionnaires, namely, Chinese Illness Perception Questionnaire-Revised (CIPQ-R) with modification for Chinese culture, Inventory of Adherence to Medication (IAM), and Inventory of Adherence to Self-Management (IASM), and a demographic and health-related characteristics form were adminstered by the SI and three trained reserch assistants (RAs). The adults who could read and write filled the questionnaires by themselves. For those who did not read and write, the SI or trained RAs read each item in the questionnaires and gerenal information form for the participants and recorded their responses on the questionnaires. The questionnaires were completed in about 40 minutes. It took longer for those who were unable to read and write. Blood pressure, height, and weight were taken by the SI or RAs.

Research Assistant Training

Two Masters level nursing students and a registered nurse were selected and trained as Research Assistants (RAs) to assist in subject recruitment, data collection, and data entry. These nursing students completed Human Subjects Education Certification

through Loma Linda University's online training. A training manual (see appendix F) with instructions on the processes of recruitment, data collection and data entry was developed by the PhD Student Investigator (SI) and given to each RA. A training session was provided; it included an introduction to the study purpose, aims, descriptions of informed consent, the procedure of obtaining an oral informed consent, and the appropriate approach for explaining the research to the participants. Each item in the questionnaires was explained one by one to ensure correct and consistent interpretation. Research assistants were also instructed not to prompt for answers but if the participants did not understand clarification was given. Correct and consistent method of blood pressure (BP) measure was also discussed and demonstrated. The training session was evaluated by having the RAs demonstrate the data collection process with each other. The SI observed the initial recruitment, consenting and data collection practices of each RA and randomly checked each RA as they conducted their research duties throughout the study.

Measurement of Concepts

Demographic and Health-related Characteristics

The researcher developed survey questionnaire included a code number for each study subject. The following demographic and health-related information about the subject was collected: age, gender, length of diagnosis, education, annual household income, weight, and height, (see Table 1), antihypertensive medications, including herbal medications, and other alternative activities to manage BP, for example, Qikong. Some of these data were collected by reviewing personal health files in the health care center and

then verifying accuracy with the subject. In addition to the personal information, the questionnaire include the instruments used to measure the variables of interest in the study (see the survey questionnaire in Appendix G).

Weight, Height and Body Mass Index Measurement

Two scales with height measures were borrowed from the hospital and were checked by the clinical engineering department every six months for accuracy. A label of "calibrated" indicatedthat the device was checked with qualifications. The researcher or a RA took the measure of weight and height separately for each participant before the questionnaires were administered, and then the body mass index (BMI) was calculated and taken as one of the variables to predict blood pressure, as BMI was a strong predictor for blood pressure reported by others (H. Wang et al., 2013; Xu et al., 2013). BMI was calculate by creating a Syntax (in SPSS) with a formula of weight in kilogram divided by height in meters squared.

Illness Perception

Illness perception was measured using the Chinese Illness Perception Questionnaire-Revised (CIPQ-R) which was modified for Chinese culture. The Illness Perception Questionnaire (IPQ) was originally developed by Weinman et al. (1996). IPQ-R is a version of revised IPQ developed by Moss-Morris, Weinman, J, et al. (2002). The CIPQ-R for Chinese hypertension patients was modified and validated by S. L. Chen, Tsai, and Lee (2008). The CIPQ-R contained three components: Illness Representations (IR), Identity, and Causes.

Table 1. *Description of study variables*

Variable	Units/Number of items	Level of measures	Reliability	Validity
Independent variables				
Personal characteristics				
Age	In years	Continuous	N/A	N/A
Gender		Categorical	N/A	N/A
Length of diagnosis	In years	Continuous	N/A	N/A
Education	In years	Continuous	N/A	N/A
Annual house hold income	In Yuan	Continuous	N/A	N/A
Weight	In Kilograms	Continuous	N/A	N/A
Height	In meters	Continuous	N/A	N/A
Illness Representation Component	35 items			
Timeline subscale	5 items	Continuous	0.79	
Timeline cyclical subscale	4 items	Continuous	0.83	
Consequence subscale	5 items	Continuous	0.81	
Personal control subscale	6 items	Continuous	0.77	
Treatment control subscale	4 items	Continuous	0.67	
Coherence subscale	5 items	Continuous	0.80	
Emotional representation subscale	6 items	Continuous	0.86	
Identity component				
Identity Score	30 symptoms	Counts	N/A	
Causal attributions componet	18 items			
Psychology subscale	7 items	Continuous	0.80	
Risk factor subscale	3 items	Continuous	0.73	
Balance subscale	5 items	Continuous	0.72	
Cultural attributions	3 items	Continuous	0.80	
Adherence to medication	13 items	Continuous	0.89	Construct validity
Decrease type of dosage deviation subscale	3 items	Continuous	0.90	
Increase type of dosage deviation subscale	5 items	Continuous	0.89	
Un-intentional dosage deviation subscale	5 items	Continuous	0.74	
Adherence to self-management	11 items	Continuous	0.70	Construct validity
Healthy diet subscale	4 items	Continuous	0.70	
Unhealthy diet subscale	5 items	Continuous	0.72	
Exercise subscale	2 items	Continuous	0.96	
Dependent Variable				
Systolic blood pressure	In mmHg	Continuous	N/A	
Diastolic blood pressure	In mmHg	Continuous	N/A	

Illness Representation

The Illness Representation (IR) component of the validated CIPQ-R had seven subscales and 35 items including timeline (5 items), timeline cyclical (4 items), consequences (5 items), treatment control (4 items), personal control (6 items), coherence (5 items) and emotional representations (6 items) (S. L. Chen et al., 2008). All items were rated on a five-point response scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher score meant stronger belief (see Table 1 for reported reliability levels for each of these scales and Appendix G for the scale).

Cause

The cause component of the CIPQ-R had four subscales, namely, psychology, risk factors, immunity, and accident/chance with 22 items in original IPQ-R. The Chinese version was modified by adding two subscales, balance and cultural attributions to assess the unique attribution of Chinese medicine (S. L. Chen et al., 2009). Two subscales, immunity, and accident/chance, were excluded from the IPQ-R due to being irrelevant to the etiology of hypertension. Therefore, the CIPQ-R for hypertension had four subscales—psychology (7 items), risk factors (3 items), balance (5 items), and cultural attributions (3 items) resulting in 18 items for the cause component. The items were rated and interpreted in the same way as that of IR component. Just as described in original IPQ-R, participants were asked to write down three main causal attributions they thought cause hypertension to detect the unique cultural influence (see Table1 for reported reliability levels for each of these scales and Appendix G for the scale).

Identity

Identity component was measured by asking the participants to rate either experienced or not experienced for 30 possible hypertension-related symptoms (Appendix G for the scale). For the experienced symptoms, participants rated whether the symptoms were hypertension-related. Each symptom experienced and checked as related to hypertension was equal to one point and the sum of points was the score of the identity component. The higher the score, the more symptoms related to hypertension were experienced.

The modified IPQ-R for Chinese population was tested for reliability and validity by Chen et al. (2008) with good outcomes (see reported values in Table 1). Seven factors of Illness Representation component were produced and accounted for 58.98% by Chen et al. (2008). The treatment control subscale had the lowest Cronbach's alpha level (0.67). The rest of the subscales present good reliability coefficients (0.77 – 0.87). Comfirmatory factor analysis showed that factor loadings for all items were above 0.50. The *t* – values for loading ranged from 6.79 – 17.38 and were significantly greater than 1.96. Thus, the results indicated the items were able to represent their underlying constructures. Also, no cross-loading were found, so that the convergent validity was supported. The correlation coeficients among all factors were greater than 0.85 and all the confidence interval analyses between each of two factors excluded the value. These indicated that each pair of constructs was empirically distinct, and discriminant validity was evident.

The above review of CIPQ-R subscales indicated adequate reliability and validity of the CIPQ-R modified for the Chinese population. This CIPQ-R modified and validated for Chinese population in Taiwan was expected to be valid for Chinese population in mainland China.

Adherence

Adherence to Medication

The adherence to medication was measured using the Medication Adherence Inventory (MAI) developed by S. L. Chen et al. (2009). The MAI had three subscales with 13 items: decrease type of dosage deviation, increase type of dosage deviation, and unintentional dosage deviation including taking medication intermittently, drug holiday and deviation in timing (see the Table 1). The items' response options for MAI include *never, occasionally, sometimes, often,* and *always* (see Appendix G). The explanation of above rating principles was provided at the beginning section of the tool. *Never* meant that the participant had never done it in the past month, while *occasionally* indicated the participant did it one to two days, and *sometimes* indicated done three days, *often* indicated four to five days in the past month and *always* indicated everyday. The scores were given from 1 (*never*) to 5 (*always*). The scores of negative statement was reversed. The higher score indicated higher adherence. Principle Component Analysis (PCA) was assessed to finalize the tool resulting in 13 items and three factors extracted accounting for 69% of the total variance (S. L. Chen et al., 2009). Concurrent validity was tested by examining the correlations between diastolic blood pressure measures and total score of

MAI and the score of unintentional.The subscales of increase, decrease and intentional type also presented high reliability (Cronbach alph ranged from 0.74 to 0.90) (S. L. Chen et al., 2009). Strong reliability and validity of the MAI instrument suggested that MAI could be approriately used in the survey among population in the mainland of China (Table 1).

Adherence to Self-management

Adherence to self-management was measured using the Inventory of Adherence to Self-management (IASM) which was also developed by S. L. Chen et al. (2009). Using Principle Component Analysis (PCA), Chen et al. extracted four factors: unhealthy diet, healthy diet, exercise regimen, and appointment keeping . Due to low internal consistency, appointment keeping was eliminated from the scale and three factors were left with 11 items which explained 56.13% of total variance (see Table 1). Three subscales of IASM were reported with high reliability ranged from 0.72 – 0.96 (S. L. Chen et al., 2009). The items' response options for IASM also include *never, occasionally, sometimes, often,* and *always* and the scores are given from 1 (*never*) to 5 (*always*). (see Appendix G). The scores of each subscale were summed up. The higher the score is, the higher adherence.

For this study, permision to use the Chinese IPQ-R, MAI, and IASM in the mainland of China was obtained from Prof. Chen (see Appendix H). The traditional Chinese characters were changed to simplified Chinese to maxmize the readability of the questionnaire.

Blood Pressure Measurement

BPs were measured twice with a digital sphygmomanometer before the administration of the questionnaires. Four digital sphygmomanometers were borrowed from the hospital which were checked by the engineering department every six months for accuracy with a label of "calibrated". The first BP measurement was in a sitting position with arm placed at the same level of the heart after patients were seated and rested for at least five minutes. The second was measured in the same position one minute after the first. The mean of the systolic and diastolic blood pressure readings was used as the outcome for that time point.

Statistical Analysis

Data Entry

Data was coded with identification (ID) numbers and entered into SPSS version 21.0 by the researcher. The dichotomous data such as gender, living arrangement, and employment status, was coded with numbers ("0" or "1"). Missing data were presented as "9999" which did not appear for any other variable in the data set (Field, 2009). Data from the Illness Representation (IR) component of Illness Perception were entered using 1 = *strongly disagree* to and 5 = *strongly agree*. Item 1, 4, 14, 16, 17, 18, 22, 23, 24, 25, 26 in the IR component was reverse coded (see Appendix X "Using and Scoring of IPQ-R"). All other subscales of Illness Perception did not contain any reverse items. For Identity score component of Illness Perception, the coding is 1 = *yes*, and 0 = *no*. For cause subscales of Illness Perception, data was entered using 1 = *strongly disagree* to 5 =

strongly agree. For Inventory of Adherence to Medication (IAM) and Inventory of Adherence to Self-Management (IASM) scales, 1 = *never* to 5 = *almost always*. No reverse items were found in both IAM and IASM. Weight and height were also entered and BMI was calcualted by dividing the weight with squared height in meters. Two systolic blood pressure (SBP) measures and diastolic blood pressure (DBP) readings were entered separately in the columns. SPSS syntax was created for data calculations.

Data Cleaning and Data Treatment

Assessing for and dealing with missing data were key steps in the data preparation period. Data cleaning involved three steps. First, the researcher checked the entire data for any inaccurate entry including the numbers, headers, and wrong coding for categorical data. Inaccuracies was traced back to the original data and corrected. According to the "Using and Scoring the IPQ-R Subscales" provided by Dr. Chen in Taiwan who conducted several studies on illness perception (S. L. Chen et al., 2011; S. L. Chen et al., 2008, 2009) for subscales with 6 items, the allowed maximum missing items was two, for the remainder, 1 item was allowed to be missed (see Appendix 7 for "Using and scoring missing data"). When data were missing beyond that allowed, the case was deleted. The missing data was also reviewed by running frequency for categorical data and descriptive statistics for measurement variables. Missing values would be handled as follows if there were any: (1) The List-wise option was used when a missing value was < 5% for both categorical variables and measurement variables; (2) The missing value was to be defined as a new category, if a categorical missing value was ≥ 5%; (3) The

transform, or replace missing value was to be used when a missing value of measurement variables was between 5% and 15%: (4) variables or cases were to be dropped if the measurement variables were missing more than 15%. Both IAM and IASM scales were treated the same. In the current study, the data collected did not have any missing values. Third, transforming and rearranging columns and rows were conducted to ensure all variables were available for analysis. The current data did not require any transformational procedure. For Illness Representation subscales, the created syntax was used to compute the sum score of each subscale. For the Identity component, the sum of items for hypertensive symptoms experienced by the participants was the identity score. The Cause component was computed for each causal risk based on given codings attached to the items. For IAM and IASM scales, the score of all items on each scale was summed. Two SBP readings and two DBP meassures were averaged and the mean SBP and DBP was used.

Assessing for Normality and Outliers

Continuous data was assessed for its distribution and outliers using histogram, boxplots, and Komogorov-Smirnov test on SPSS (Field, 2009). The normality was judged based on these three approaches. A normal distribution was concluded when the results of two or three approaches indicated normal distribution. If the distribution was not normal, data transformation would be performed to reach the normality assumption (Field, 2009). Otherwise, non-parametric tests would be used if transformations failed. The outliers were checked manually by the researcher to determine if it was an error or

not and a decision of adjusting the score was made. Transformation of the data would be performed to correct the outliers. Changing the score to be one unit above the next highest score in the data set would be applied when transformation failed (Field, 2009). Furthermore, homogeneity of variance test using Levene's test was also performed to detect the unstable variance. Cook's distance, multicolinearity and linearity were tested before running multiple linear regression (Field, 2009). However, the data collected was almost normally distributed, so the transformation of the data was not needed.

Item Analysis

Items in the seven IR subscales, IAM and IASM scales were analyzed respectively for their item-to-total statistics, if the internal reliability of a scale, as indicated by a Cronbach's alpha, was less than 0.70, which suggested a less internal stability of a scale (Shultz & Whitney, 2005). Item-to- total statistics measures the relationship of each individual item to the overall score of the scale. When the scale's alpha was much higher than the original alpha with the item excluded, whether this item should be deleted to improve the overall reliability of the scale was considered. In the current study, none of the items in aforementioned three sets of quesionnaires were deleted.

Test for the Scales

Cronbach's alpha was analyzed to assess the reliability of all subscales of Illness Perception (Field, 2009), IMA and ISMA. The discriminant validity of the subscales of Illness Perception was analyzed by the following method. First, the correlation

coefficients were compared among the variables with the square roots of average variance extracted estimates made. The discriminant validity was supported if the latter were greater than the correlations coefficients on the off-diagonal in the inter-correlation matrix (Shultz & Whitney, 2005). Second, when the confidence interval between each pair of the variables excluds the value of "1", it indicated that each pair of subscales was empirically distinct. All three scales demonstrated adequate reliability and divergent validity to measure the concepts.

Analysis Plan for Research Questions

Data analysis was performed to answer each question as follows:

Aim One

Describe the demographic and health-related characteristics, levels of illness perception, medication and self-management adherence, and hypertension in the study sample.

Question One

Using the appropriate descriptive analysis, what were the demographic and health-related characteristics of the study participants?

Analysis Strategy

Frequencies were run to analyze the proportion of the participants of each gender, employment, and living arrangement group. Descriptive statistics were performed to summarize the measures of central tendency and the measures of variability of age, household annual income, and length of diagnosis.

Question Two

What were the summed subscale and total scores for measures of illness perception, medication adherence and self-management, and SBP and DBP in this study sample of hypertensive rural adults living in mainland of China?

Analysis Strategy

Descriptive tests were performed to summarize the measures of central tendency and the measures of variability for all subscales of Illness Perception, IAM, IASM, and blood pressure.

Question Three

What were the demographic and health-related characteristics associated with illness perception?

Analysis Strategy

Two sample- *t*-test was used to compare the mean variables in illness perception between two genders and marital status for its dichotomous attribute. ANOVA was applied to detect the differences in illness perception for living arrangement and employment. Pearson correlation test was used for continuous variables. Pearson test, as a parametric test, was used.

Question Four

Did an intercorrelation exist among all variables of illness perception?

Analysis Strategy

Pearson's correlational tests were run to determine the intercorrelation among all

variables of illness perception.

Aim Two

Examine the association between demographic and health-related characteristics and blood pressure.

Question One

What was the relationship of each demographic and health-related characteristics with BP?

Analysis Strategy

Two sample- *t*-test was used to compare the mean BP between two genders and marital status for its dichotomous attribute, Pearson or Spearman correlation test for continuous variables. Pearson test, as a parametric test, was used when the continuous data was normally distributed, otherwise, Spearman test was applied.

Question Two

What demographic and health-related characteristics predicted BP in this study sample?

Analysis Strategy

The variables with significant findings in the bivariate analysis was entered for multiple linear regression test to detect the most significant variables predicting BP.

Aim Three

Question One

What was the structure validity of causal subscale of illness perception?

Analysis Strategy

Exploratory Factor Analysis was applied to test the structure validity of causal subscale.

Question Two

What was the relationship of each subscale of illness perception with DBP and SBP?

Analysis Strategy

For illness perception, the mean of each subscale was tested for its relationship with SBP and DBP using either Pearson correlation test.

Question Three

Which scales of Illness Perception predicted SBP and DBP in this study sample?

Analysis Strategy

Significant variables found in the bivariate analysis were entered for multiple linear regression testing.

Aim Four

Determine how medication and self-management predict blood pressure control.

Question One

What was the relationship of the measures of adherence to medication and adherence to self-management with SBP and DBP

Analysis Strategy

Pearson's correlation test was used to find the relationship between medication

adherence and BP and self-management and BP.

Question Two

How did medication and self-management adherence predict SBP and DBP in this study sample?

Analysis Strategy

Significant variables found in the bivariate analysis was entered for multiple linear regression test.

Aim Five

Question One

What was the strongest prediction model among demographic and health-related characteristics, illness perception, and adherence for blood pressure in hypertensive adults in rural China.

Analysis Strategy

All significant variables of demographic and health-related characteristics, illness perception, and treatment adherence were entered into a multiple linear regression equation to determine which were the strongest predictors (Cohen, 1988).

CHAPTER FOUR

RESULTS

Introduction to the Chapter

The purpose of the current study was to examine the relationship among demographic and health-related characteristics, illness perception, adherence to medication and self-management and blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. This study aims to (a) describe the personal characteristics, levels of illness perception, medication and self-management adherence, and hypertension in the study sample; (b) examine the association between personal characteristics and blood pressure; (c) examine the relationship between illness perception and blood pressure; (d) examine the relationship between medication or self-management and blood pressure; and (e) determine how well the personal characteristics, illness perception, and medication and self-management adherence explain blood pressure.

Data were collected from two rural villages in mainland China. Of the 220 potentially eligible participants, 163 participants were interviewed at the local health care center. In this chapter the findings from the current research are included in two publishable papers. Following the two publishable papers, additional findings are also presented. The chapter ends with a brief summary of the study.

Findings for aim (a) with five related questions are presented in the first embedded paper. Specifically, the demographic characteristics such as gender, age, years of education, annual household income, employment status and health–related characteristics such as BP, BMI, and length of diagnosis are described. The mean scores

of illness perception variables among rural dwelling hypertensive adults in mainland China are presented and compared with those of other studies. The interpretation of the mean scores of each subscale is delineated. Following the descriptive analysis personal characteristics, the interrelations among the variables of illness perception are analyzed and the personal factors associated with illness perceptions are identified. In addition, the most frequently rated hypertension-related symptoms and causal attribution of hypertension are also described.

The second paper presents the findings for aims "b" through "e" described above. The associations of personal and health-related characteristics, illness perception, adherence to medication and self-management with blood pressure are presented. Lastly, the strongest predictors of blood pressure in this study's sample are identified.

Following the two publishable papers, additional findings for aim "a" - question two, specifically the causal factors identified by the study participants and symptoms rated as being related to hypertension are presented. The factor analysis for aim "c" question one is delineated. This chapter concludes with a summary of the study findings.

First Publishable Paper

Illness Perceptions of Chinese Rural-Dwelling Adults with Hypertension:

A Cross Sectional Study

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Abstract

Poor hypertension control in China has caught health-care providers' attention. In 2013, the prevalence of hypertension was reported as high as 22.6% in Zhejiang province, China. Among these people, only 18% had their blood pressure adequately controlled. To achieve better outcomes, providers need to understand what rural Chinese adults with hypertension perceive hypertension. This study aimed to describe levels of illness perception and identify interrelations among illness perception and demographic and health-related characteristics in a sample of rural adults with hypertension. This is a cross-sectional, descriptive, correlational study. Data were collected from 163 hypertensive Chinese adults aged 18 and older in two rural villages in Zhejiang Province, China. Face-to-face interviews using a structured questionnaire were conducted. Illness perception was measured by the Chinese Illness Perception Questionnaire-Revised (CIPQ-R). Demographic data were collected during an interview. Weight, height, and blood pressure were measured with a calibrated scale and digital sphygmomanometer before the interview–administered survey questionnaire. Measures of central tendency and frequencies were calculated and inferential bivariate statistics were used to analyze the data after internal reliability for the CIPQ-R was tested using Cronbach's Alpha. The findings showed that study participants' systolic blood pressure (SBP) was inadequately controlled (M = 146.59) while their diastolic blood pressure (DBP) was better controlled (M = 80.52). The blood pressure control rate was 28.80%. Participants viewed hypertension as a chronic disease without serious consequence that could be controlled

by personal and treatment efforts. The participants had a limited understanding of hypertension and limited negative emotional responses to the disease. Although the participants believed the symptoms of hypertension varied little, they identified dizziness and fast heart rate most frequently as symptoms. Participants attributed balance factors (e.g. being overworked, having poor sleeping patterns, changing weather) and psychological factors to hypertension followed by risk factors and cultural factors. Age, education, body mass index, and household annual income were associated with illness perception and inter-correlations existed among variables of illness perception. Chinese rural hypertensive adults had inadequately controlled blood pressure and developed unique illness perceptions differing from other populations. These findings support the Self-Regulation Model suggesting that social background influences illness perception. This study supports the need for a comprehensive health education program to increase rural adults' knowledge and management of hypertension. Further research identifying factors influencing illness perceptions is required. The CIPQ-R requires modification and validation to improve the internal reliability of the subscales with rural Chinese.

Key words: Hypertension, illness perception, illness representation, rural Chinese

Hypertension is a major public health challenge in China as well as in the world (S. L. Chen et al., 2009; Kearney et al., 2005; L. D. Wang, 2005). Zhejiang Province, one of the richest provinces in mainland China, was recently reported to have a 22.6% prevalence rate for hypertension (H. Wang et al., 2013). This high rate exists despite the establishment of the new Rural Cooperative Medical System (RCMS) intended to address health needs within most of the country's rural households (Sara, B. & Yao, L, 2010). With the availability of medical care, hypertension should be adequately managed. However, in China the rate of hypertension awareness, treatment, and control remains low, and varies from one place to another (J. Liu et al., 2008). In some rural regions, treatment is nonexistent percent due to limited access to quality medical care and poor health education (S. Yang et al., 2011). H. Wang et al. (2013) reported that only 54% of hypertensive adults in Zhejiang province were aware of their hypertension and; of those 46% who were taking antihypertensive medication, only 18% had controlled blood pressure.

Researchers have observed that illness perception was a factor influencing adherence to medication and self-management (S. L. Chen et al., 2009), medication choice (M. Figueiras et al., 2010), and clinical outcomes such as functions and disease status (Fowler & Bass, 2006; Gosse, 2007; Groarke et al., 2005).Given how potentially important understanding illness perception is to managing HTN, it is also beneficial to consider how illness is associated with personal characteristics linked with uncontrolled HTN (Li et al., 2010; H. Wang et al., 2013; Xu et al., 2013).

To adequately control blood pressure (BP), health providers should consider a patient's illness perception when offering treatment (Pickett et al., 2014). To date, no

study has described illness perceptions of hypertension and its associations among Chinese rural adults with hypertension in mainland China. This paper aims to describe the illness perceptions of rural adults with hypertension in mainland China and explore the inter-relationships among the variables of illness perception and associations between illness perceptions and demographic and health related characteristics.

Literature Review

Illness perception of hypertension may influence blood pressure control. According to the self-regulating model (SRM) proposed by (Leventhal et al., 1984), individuals hold both cognitive and emotional representations of illness. The formation of an illness representation is influenced by personal traits and illness characteristics. After the formation of the illness representation, problem-based and emotion-focused coping responses are used to deal with challenges related to the illness. As the final step, appraisals of one's own behavior and physical response are continually made, which changes the illness representations and leads to self-regulated coping. Illness perception consists of three components (Moss-Morris, Weinman, Petrie, et al., 2002): illness representation (IR), cause, and identity. IR is further divided into seven variables: timeline, timeline cyclical, illness coherence, consequences, personal control, treatment control, emotional response. Timeline and consequences are the predictive beliefs about how long the condition might last and the consequences of the condition. Timeline cyclical refers to variations in the disease symptoms, while illness coherence is the extent of patients' understanding of their diseases. Treatment control and personal control are individual's beliefs about the best way to control their condition and effectiveness of the treatment. Finally, the emotional response refers to the negative emotional reactions to

the illness such as fear, depression, and anxiety (Moss-Morris et al., 2002). Identity is the label or name given to the condition and the symptoms that appear to go with it. Cause attributions represent the individuals' assumptions about what triggers the illness. Several studies have reported that illness perception influences the outcomes of disease through the coping mechanisms used in adapting to the diagnosis (Cherrington et al., 2006; Groarke et al., 2005; Kim & Evangelista, 2010; Pickett et al., 2014; C. Y. Sun, 2010).

Only two Taiwanese studies provide information about illness perceptions among Chinese adults with hypertension (S. L. Chen, Lee, Liang, & Liao, 2014; S. L. Chen et al., 2009). A cross-sectional study of hypertension patients (N = 310) suggested that participants believed hypertension is a long-term disease that can be controlled through treatment and personal control (S. L. Chen et al., 2009). These findings are congruent with those of a cross-sectional study (N = 242) in the United Kingdom (U.K.) (Ross et al., 2004), a Portuguese study (N = 191) (M. Figueiras et al., 2010), and a study with an African American hypertensive population (Pickett et al., 2014). For the timeline cyclical, or stability of hypertension, S. L. Chen et al., (2009) reported that Chinese patients in Taiwan perceived their blood pressure as stable, which is inconsistent with the findings in the studies with the population of the U.K. and African Americans. Furthermore, Taiwan Chinese hypertensive patients reported that their hypertension would not have serious consequences, which is consistent with the findings in the U.K. study and inconsistent with the findings of Portuguese study and the African American study. Both the Taiwanese study (S. L. Chen et al., 2009) and the U.K. study (Ross et al., 2004) reported less negative emotional response when compared with the findings found among Portuguese hypertensive patients (M. Figueiras et al., 2010).

All participants in the aforementioned Taiwanese, U.K., and African American studies attributed hypertension to psychological factors such as mood, mental, and family problems (S. L. Chen et al., 2009; Pickett et al., 2014; Ross et al., 2004). Besides the psychological factors, some also attributed hypertension to risk factors (e.g. smoking) or "balancing factors" including weather change, poor air, and blood circulation, and so forth (S. L. Chen et al., 2009; Pickett et al., 2014).

Studies of persons with chronic illness have reported that inter-relationship exists among the variables of illness perception (S. L. Chen et al., 2008;Hagger & Orbell, 2003). For example, S. L. Chen et al., (2008) reported that control and coherence were found to be positively associated with each other and both were negatively associated with emotional response. The emotional response was positively associated with serious consequences, chronicity, and timeline cyclical.

Factors such as gender, age, and length of diagnosis associated with illness perception have been reported in the literature. Findings from a longitudinal study with Taiwanese (N = 118) suggested that both genders that men were more likely to attribute their hypertension to risk factors while women more to balancing factors (S. L. Chen et al., 2014). In the African American study, more men than women believed that risk factors caused hypertension and more women believed that psychological factors caused their hypertension (Pickett et al., 2014). Also, men had a greater sense of personal control over their hypertension than women (S. L. Chen et al., 2009). Age was statistically associated with the mean scores of consequence, personal and treatment control, emotional response, and psychological factors in the U.K. study (Ross et al., 2004).

Pickett et al. (2014) reported that patients having a diagnosis of hypertension for more than five years perceived hypertension as a long- term disease.

The aforementioned studies about illness perceptions and hypertension from around the world, however, have limitations. Only the report from Chen et al., (2009) covered all dimensions of illness perceptions as theorized by the SRM. The Portuguese study did not include causal factors, while the African American study did not include emotional response and identity and the U.K. study did not investigate illness coherence. For the identity measure, none of the studies reviewed above identified the specific symptoms endorsed by people to be hypertension related. Except for one study (Pickett et al., 2014), all participants in the studies reviewed above were recruited from hypertension clinics and had a mean age between 60 and 65. Because age, social background, culture, gender, years of education, length of diagnosis, and blood pressure measures may influence the different illness perceptions among hypertensive people, it is necessary that research continue to examine these factors.

Methods

Design and Settings

This study used a descriptive, cross-sectional, correlational design.

Setting, Sample, and Recruitment

This study was conducted in two rural villages in Zhejiang Province, China. People who met the following inclusion criteria were recruited: (a) be an adult 18 years and older; (b) have a diagnosis of hypertension (HPT) for a minimum of three years (systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg); (c) live in the area of the two villages; (d) receive (or received) medication treatment and

recommendations for self-management activities, and (e) be able to respond to survey questions either by reading/writing or verbally. Adults with any other significant chronic physical comorbidity that involved pharmacological therapy were excluded. To identify eligible participants, the investigator reviewed health files in the local health care center. The purpose of the study was explained to each of the eligible adults through telephone contact. Eligible adults who were willing to participate were scheduled for an interview with a research team member. A sample size of 161 was targeted based on 80% power to detect an *R*-squared of 0.10 attributed to 13 independent variables (Cohen, 1988).

Ethical Considerations

Ethics approval was obtained from the Institutional Review Board of a health sciences university in the United States. Approval of cultural appropriateness of the study and a local contact for the study were obtained from a local university and affiliated hospital in China. Agreement to access health records of the villagers with hypertension was provided by the president of the health care center. Before the data collection, the participants were apprised of the purpose and process of data collection and that they could refuse to participate. Verbal consent to participate was obtained.

Procedure

Using the structured demographic and survey questionnaires, three trained graduate nursing students and the researcher conducted face-to-face interviews and completed the questionnaires. Blood pressure, height and weight were measured by the researchers.

Measures

The Chinese Illness Perception Questionnaire-Revised (CIPQ-R) was revised from the English version of Illness Perception Questionnaire-Revised (Moss-Morris, Weinman, Petrie, et al., 2002) by (S. L. Chen et al., 2008) in Taiwan. Psychometric validation of the CIPQ-R was conducted in Taiwan among hypertensive patients with good internal reliability (Cronbach's alpha = 0.65 - 0.87). The CIPQ-R consisted of 35 items in three components: Illness Representation (IR), Causal factors, and Identity. The Illness Representation (IR) scale has seven subscales including timeline (5 items about the duration of illness), timeline cyclical (4 items about the variation of the disease), consequences (5 items), treatment control (4 items about the medication effectiveness), personal control (6 items about the effectiveness of personal activities), coherence (5 items about understanding of the illness), and emotional responses (6 items about negative feelings toward illness). All items were rated on a five-point response scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) with reverse scoring when appropriate. A higher score indicates stronger beliefs on each perspective of illness perception. Due to the existence of the higher-order structure model, the composite scores resulting from the control scores (personal control + treatment control) and the negative IR (consequence + timeline cyclical + emotional response) were suggested to be used by Chen and colleagues (2008). For this study, the internal reliability of the illness representation subscales varied between 0.63 - 0.86. The illness coherence subscale presented the lowest reliability among all other subscales in IR subscales.

The causal scale of the CIPQ-R, adjusted by Chen et al. (2008) to reflect Chinese culture, includes four subscales: psychological factors (7 items), risk factors (3 items),

balance (5 items), and cultural attributions (3 items, e.g. bad luck). The items are rated and interpreted in the same way as that of the IR component. The 18 - item causal scale was factor analyzed. The item of "poor medical care in the past" was deleted, because it loaded unexpectedly on the psychological factor instead of the balance factor. Therefore, 17 items were retained for the current study with Cronbach's alpha ranging from 0.63 to 0.75.

The identity component was assessed by asking participants to rate 30 possible hypertension-related symptoms as present (*yes* or *no*). The participants were asked to further rate whether they perceived the symptoms as hypertension-related. Each symptom present, and rated as related to hypertension, was equal to one point and the sum of points was the identity score.

Blood pressure (BP) was measured twice using calibrated digital sphygmomanometers before the administration of the questionnaire. The first BP measurement was in a sitting position with arm placed at heart level after participants were seated and had rested for at least five minutes. The second BP was measured in the same position one minute after the first. The mean of the systolic blood pressure (SBP) readings and the mean of the diastolic blood pressure (DBP) readings were used for analyses. Height and weight were measured with a calibrated scale. The body mass index (BMI) was calculated using the formula of weight divided by squared height.

Statistical Analysis

SPSS version 21.0 was used to analyze the data. Frequencies and measures of central tendency were used to analyze demographic and health-related characteristics.

Independent *t*-test and ANOVA were employed to compare mean differences of illness perception between/among groups. Pearson's *r* (correlation) was used to explore relationships among CIPQ-R subscales and demographic variables. Cronbach's alpha was calculated to assess the internal reliability of the CIPQ-R. The accepted standard for significance for statistical tests was an alpha of 0.05.

Results

Of 220 eligible adults, 163 completed the data collection process. Most participants had no more than 14 years of education (Median = 5); 1 in 5 had none. The median of household income was 24,000 yuan (Minimum = 1,200; Maximum = 500,000). The majority of the participants were married (82.2%) and most lived with family (88.30%). Most of the participants were not employed and some people (20.20%) indicated they were running their own business. The other demographic characteristics of the sample are presented in Table 2. Two-thirds of the participants had unmanaged SBP and 28.80% of participants had both SBP and DBP adequately controlled. Only two took no medication but did use herbs to control blood pressure.

Illness Perception

Table 3 presents the means of responses to CIPQ-R subscales. To compare the scores of the subscales, mean scores were divided by the number of items. The highest mean scores were found for timeline and control subscales indicating that rural Chinese adults believe that hypertension is a chronic disease that can be controlled through personal and professional treatment efforts. The lowest scores were found in negative IR (consequence + timeline cyclical + emotional response) which indicates that the

participants do not report symptom variation of the illness, negative feelings or perceive their illness to have severe consequence.

The mean scores of the 17 item causal component are also displayed in Table 3. The highest mean score was on the balance factor (change of weather, overworked, etc.,) followed by psychological factor and risk factor. The lowest score was found for the cultural factor (e.g. bad luck).

The mean score for the number of symptoms experienced was 11.60 (± 5.83). The median identity score was two (Minimum = 0; Maximum = 24) with 27 participants reporting no symptoms perceived to be hypertension-related. The most frequent symptoms noted by participants included: dizziness (40%), tachycardia (34%), blurred vision (28%), sore eyes (28%), and sleep difficulty, headache, and diminished memory (20%).

Table 2. *Demographic characteristics of the study sample (N = 163)*

Demographic/health characteristics variables:	N	(%)	Mean	(*SD*)
Age (years)			65.63	(10.61)
Gender				
Male	69	42.30		
Female	94	57.70		
Marital Status				
Married	134	82.20		
Single	29	17.80		
Years of Education				
No education	35	21.50		
Less than 14 years	128	78.50		
Living arrangement				
Alone	10	6.20		
With family in the same house	144	88.30		
Near family	9	5.50		
Employment status				
Unemployed	69	42.30		
Farming	31	19.00		
Office	8	4.90		
Workshop	22	13.50		
Others	33	20.20		
Length of diagnosis in years			9.81	(6 .17)
Weight (Kg)			62.50	(11.29)
Height (Meter)			1.59	(0 .07)
BMI			24.58	(3 .51)
SBP			146.59	(16.87)
≥140(mmHg)	104	66.90		
DBP			80.52	(12.64)
≥90 (mmHg)	41	35.20		
SBP/DBP				
<140/90mmHg	47	28.80		

Table 3. *Mean scores and reliability of subscales of illness perception (N =163)*

Variable	Items	Total Score		Average Item Score		Cronbach's α
		Mean	*SD*	Mean	*SD*	
Illness representation	35					
Timeline	5	19.88	3.34	3.98	.76	.76
Neg.IR[a]	13	34.30	9.14	2.64	.86	.73
Control[b]	12	39.50	5.57	3.29	.67	.77
Coherence	5	13.42	3.34	2.68	.63	.63
Causal component	17					
Psychological factor	6	16.12	4.74	2.69	.79	.75
Balance factor	5	14.90	4.01	2.98	.80	.72
Cultural factor	3	5.55	2.22	1.85	.63	.78
Risk factor	3	7.80	2.64	2.60	.88	.63
Identity	30	4.33	4.70	.15	.16	.82

[a] Neg. IR is short for negative illness representation including consequence, timeline cyclical, and negative emotional response. [b] Control is personal control + treatment control

Demographic Characteristics and Illness Perception Subscales

Table 4 presents the mean score difference in illness perception variables by demographic characteristics. The mean score of the causal subscale was significantly different for those not employed or farming. The mean scores of illness coherence, psychological factors, and risk factors were significantly different between gender groups. The rest of the categorical variables had no effects on IR subscales and causal subscales. Table 5 shows the correlation between illness perception and continuum personal data. Age was negatively associated with illness coherence, control, and perceived risk factor, while education attained is positively associated with illness coherence and attribution to psychological factors, and was negatively associated with negative emotions and

attribution to balancing factor. Both BMI and income were positively associated with risk factor attribution. Furthermore, BMI was positively associated with timeline. Length of diagnosis was positively correlated with illness timeline and Neg. IR.

Table 6 depicts the inter-correlations among the variables of illness perception. Control was positively associated with illness coherence, but negatively associated with timeline. Both attribution to psychological factor and negative IR were negatively associated with illness coherence. Negative IR was also negatively associated with control of the disease. Psychological factor, balance factor, and cultural factor were positively related to negative IR. In addition, identity score was positively associated with timeline, control, negative IR, and all four causal factors.

Table 4. *Differences in illness perception variables by demographic and health-related characteristics*

Variables		Timeline	Illness coherence	Control	Negative IR	Psychological	Risk	Balance	Culture	Identity score
Gender	Male	20.17±3.07	12.87±3.61	39.48±5.17	33.32±8.79	14.94±3.65	9.14±2.74	14.45±3.51	7.16±1.82	5.10±5.32
	Female	19.66±3.53	14.16±2.79	39.55±5.87	35.07±9.36	16.98±5.25	6.82±2.08	15.22±4.33	7.22±1.96	3.85±4.18
	t	- 0.97	- 2.569	0.085	1.214	2.921	- 5.915	1.260	0.212	1.62
	P value	0.333	0.011	0.933	0.227	0.004	0.000	0.210	0.832	0.108
Marital Status	Married	19.96±3030	13.51±3.34	39.33±5.64	34.43±9.08	16.16±4.61	7.92±2.66	14.97±4.04	7.24±1.96	4.49±4.87
	Not married	19.52±3.56	12.97±3.37	40.41±5.23	33.86±9.54	15.90±5.35	7.28±2.53	14.55±3.89	7.00±1.63	3.86±4.00
	t	0.64	0.803	- 0.951	0.304	0.275	1.190	0.509	0.613	0.65
	P value	0.524	0.423	0.343	0.761	0.784	0.236	0.612	0.541	0.516
Employment status	Not employed	19.57±3.59	13.07±3.12	39.22±5.05	34.18±8.41	15.93±4.88	6.87±2.31	14.32±4.02	6.97±7.75	3.83±4.11
	Farming	19.71±3.13	12.65±3.78	39.54±6.10	35.71±11.84	15.55±4.72	7.52±3.18	16.42±3.41	6.77±2.45	4.87±5.66
	Office	20.63±3.07	15.50±3.21	41.88±4.76	33.25±5.20	16.38±4.90	9.75±2.38	14.63±4.44	8.38±1.51	4.13±4.26
	Workshop	20.36±3.84	14.23±2.67	40.27±6.56	32.68±6.80	17.59±4.39	8.95±2.36	15.18±3.29	7.77±1.90	4.95±5.31
	Others	20.18±2.74	13.82±3.59	39.24±5.71	34.70±10.03	16.00±4.72	8.79±2.16	14.55±4.64	7.39±1.54	4.73±4.84
	F	0.449	1.858	0.530	0.395	0.678	6.26	1.602	2.045	0.434
	P value	0.773	0.120	0.714	0.812	0.608	0.000	0.177	0.091	0.784
Living arrangement	Live alone	21.50±3.03	13.30±3.77	37.00±4.83	35.20±9.05	15.40±5.48	8.50±2.07	16.20±3.68	7.40±0.84	5.60±3.63
	Live with family	19.89±3.33	13.49±3.38	39.62±5.64	33.98±9.10	16.21±4.74	7.74±2.74	14.83±4.10	7.15±1.98	4.22±4.83
	Live near family	17.89±3.14	12.33±2.06	40.22±4.74	39.00±9.55	15.44±4.28	8.00±1.00	14.56±2.65	7.78±1.20	5.56±4.10
	F	2.84	0.515	1.138	1.333	0.230	0.408	0.581	0.528	0.690
	P value	0.061	0.599	0.323	0.267	0.795	0.666	0.561	0.591	0.503

Table 5. *Correlation between personal characteristics and illness perception variables*

	Timeline	Illness coherence	Control	Negative IR	Psychological	Risk	Balance	Culture
Age	-.096	-.189*	-.165*	-.012	-.080	-.214**	.073	-.147
Education	.111	.328**	.074	-.200*	-.225**	.292**	-.184*	.036
Income	.100	-.002	.100	-.013	-.009	.181*	-.061	.032
BMI	.161*	.127	.078	.024	.104	.154*	.063	.177*
Length of diagnosis	.182*	-.004	-.101	.166*	-.025	-.073	.035	-.008

**Correlation is significant at the .01 level (2-tailed). *Correlation is significant at the .05 level (2-tailed)

Table 6. *Correlation among illness perception variables (N =163)*

	1	2	3	4	5	6	7	8	9
Timeline	1								
Illness coherence	.064	1							
Control	-.279**	.212**	1						
Negative IR	-.037	-.333**	-.195*	1					
Psychological	-.118	-.193*	-.022	.431**	1				
Risk	.101	.076	.044	.063	.077	1			
Balance	-.117	-.131	.007	.373**	.488**	.151	1		
Culture	-.110	-.018	.032	.344**	.394**	.418**	.309*	1	
Identity	.154*	.036	-.028	.438**	.279**	.229*	.38**	.24**	1

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

Discussion

Among these rural Chinese adults with hypertension, the blood pressure control rate was 28.80% as compared with the 18.00% control rate in a previous study (H. Wang, et. al., 2013). This success may due to the government effort to reform the health care system (Feng et al., 2014). The health providers in the community health care centers are required to establish a health record for each individual; follow-up the individuals with chronic diseases including hypertension, guide them with treatment, and evaluate the effects (H. Wang, et. al., 2013). Even though the control rate has improved, it was still lower than that in developed countries (H. Wang, et. al., 2013). This finding suggests continuous efforts are needed to improve blood pressure control.

The study sample tended to view hypertension as a chronic disease without serious consequences and that the various symptoms could be controlled by personal and clinical treatment efforts. There was limited negative IR for the disease and limited understanding of hypertension. They attributed balance factors and psychological factors as causing the hypertension. The most frequently identified hypertensive symptoms were dizziness and fast heart rate. Personal characteristics such as gender, employment, education, age, income, and BMI were associated with different variables of illness perception, and inter-correlations exist among the variables of illness perception.

Similar to the previous studies (S. L. Chen et al., 2014; M. Figueiras et al., 2010; Pickett et al., 2014; Ross et al., 2004), Chinese rural adults believe in chronicity and controllability of hypertension. Believing in the chronicity, incurability, and controllability of hypertension has been found to be associated with adherence to

medication and self-management behaviors (S. L. Chen et al., 2009; Pickett et al., 2014). This adherence would theoretically lead to improved blood pressure control. A meta-analysis review of 45 illness perception studies also suggests that patients who perceived their illness as controllable tended to have better outcomes (Hagger & Orbell, 2003). Contrary to the above theoretical conjecture, our study showed that the majority of the participants in the current study had inadequately controlled blood pressure. This suggests other factors may be responsible for inadequate controlled blood pressure among rural Chinese adults.

A low mean score of illness coherence was observed in the current study sample, which suggests a lack of understanding of the illness. Findings in this study are inconsistent with those reported in the Taiwan study (S. L. Chen et al., 2009) in other studies (M. Figueiras et al., 2010; Pickett et al., 2014). This may be due to higher levels of education in the participants in the previous studies. For example, in Taiwan study 48.0% participants received more than six years of education. In contrast, only 30.1% of participants in the current study received more than six-year education. Most participants agreed with the statement 'I don't understand my illness.' Illness coherence plays an important role in long term adjustment and the response to the symptoms (Moss-Morris, Weinman, Petrie, et al., 2002). The findings indicate a need for basic health education about hypertension for the Chinese rural population and health professionals need to use simple language when providing the educational sessions.

The low mean score of negative IR suggests that rural adults with hypertension perceived less serious consequence from hypertension, less variation in hypertensive symptoms, and less negative emotional responses. These findings are consistent with the

Taiwan study (S. L. Chen et al., 2009), which demonstrated that Chinese people perceived less negative illness representation with hypertension. The reason for these results may be as follows. First, hypertension is an asymptomatic disease, especially in the early stage. Previous research has suggested that patients with more symptoms are likely to perceive their illness as having serious consequences for their life, which leads to a more negative emotional response (S. L. Chen et al., 2008). In this study, however, the majority of participants reported that they experienced only two symptoms as hypertension (HTN) related and many attributed no symptoms to HTN. Second, illness perception is strongly influenced by individuals' social and cultural factors (Leventhal, Brissette, & Leventhal, 2003). Chinese people are resilient and tough (S. L. Chen et al., 2009), which may also contribute to the less negative illness representations. The lower perception of negative IR may result in poor medical-seeking behavior, as Chinese people are likely to seek medical care based on how serious they perceive their illness. Therefore, less perception of negative IR suggests that more information regarding hypertension is required for this population.

We observed that Chinese rural hypertensive adults in mainland China attributed their hypertension to balance factors (such as sleeping problems, changes in the weather, so on) and psychological factors followed by risk factors and cultural factors. This finding is inconsistent with the findings of psychological and risk factor attributions in Taiwan (S. L. Chen et al., 2009). This finding revealed that the participants lacked knowledge about causes of hypertension. Thus, they may pay less attention to risk factors that are preventable.

The association among the illness perception variables is similar to the findings in

the previous Taiwan study (S. L. Chen et al., 2009). For example, the current study showed that understanding of the disease (illness coherence) was positively associated with control and negatively associated with negative IR. Understanding of the disease and believing in personal and treatment control play a significant role in hypertension management. Therefore, helping patients understand the disease is considered extremely important. Moreover, identity scores have been found to be mostly correlated with psychological factors and positively associated with treatment and personal control and coherence (Moss-Morris, Weinman, Petrie, et al., 2002). In our study, identity score was associated with all four causal factors, which support Leventhal's Self-regulating Model (SRM). SRM emphasized that symptoms or the label of a disease affected the formation of illness representation and actions. When a symptom is experienced, patients often search for the causes to attribute to illness and shape their behaviors to cope (Leventhal et al., 1997).

Consistent with previous findings (S. L. Chen et al., 2014; Pickett et al., 2014) men were more likely to attribute their hypertension to risk factors. Women were more likely to attribute their hypertension to balancing factors, which is consistent with the findings in the Taiwan study (S. L. Chen et al., 2014) and differs from African American study which suggested more women attribute their hypertension to stress factors (same as psychological factors in the current study)(Pickett et al., 2014). Furthermore, our findings indicate that gender also affects illness coherence with women presenting more understanding of hypertension; this was not found in the above-stated studies. The above findings, thus, indicate that gender effects on illness perception varies among different culture.

Age, years of education, household income, and BMI are associated with some of the variables in the current study. Among the above-mentioned independent variables, age in particular is a significant factor negatively associated with several aspects of illness perception such as illness coherence, control, and risk factor. In the U.K. study, age was negatively associated with emotional response, consequence, personal, and treatment control, and positively associated with immunological and chance factors (Ross et al., 2004).The current study and U.K. study both indicate that the older the person, the less control belief, and less attribution to risk factors, which are one of the lifestyle change targets. Without fully understanding the important role of risk factors for hypertension, the compliance to eliminating harmful practices such as smoking and excessive alcohol consumption will be hindered.

Our study also indicates that education is positively related to higher illness coherence, which means that a higher education level helps people better understand the disease. Higher education also lowered attribution to psychological factors and balancing factors and the occurrence of negative emotions, but increased the attribution to risk factors. The participants in the current study have relatively low education (one in five have no education). Therefore, more hypertension-related health education is needed particularly for the lower educated population. Such education needs to be presented in a way that is accessible to those with limited literacy skills.

Limitations

Several study limitations affect the interpretation of these findings. First, generalization of the findings is limited given the data were collected in only two rural villages. Further study with stratified sampling at the national level is required to more

fully understand the illness perceptions of the rural dwelling hypertension adults. Secondly, the illness perception subscales were difficult to understand by those who had limited or no education. This may have influenced the accuracy of the information collected. Finally, the descriptive correlational design of the current study found certain associations between some of personal characteristics and illness perception, but the predictive value of personal characteristics for illness perception is undetermined. A longitudinal study is needed to fill the gap.

Conclusion

This study found that Chinese rural-dwelling hypertensive adults had inadequately controlled blood pressure, especially the systolic BP, and were overweight. They also developed illness perceptions differing from that of other populations. Age, years of education, household income, and BMI were associated with different variables of illness perception. These findings support the Self-Regulation Model suggesting that social background influences people's illness perception. Given the findings that Chinese rural adults do not perceive hypertension as a disease with serious consequence, do not identify many hypertension related symptoms experienced, and have a poor understanding of hypertension. It is recommended that health providers devise a comprehensive health education program to increase rural adults' knowledge and management of hypertension. This education needs to be presented in a way that meets the literacy levels of rural adults. This study was the first to describe the illness perceptions of hypertensive rural dwelling adults in mainland of China. Therefore, further research to explore illness perception and to identify factors influencing illness perceptions is recommended. Health providers who have direct contact with patients

should be able to assess illness perception and make efforts to provide counseling or teaching to promote hypertension management. Moreover, CIPQ-R requires modification and validation to improve the internal reliability of the subscales with a rural Chinese population.

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CHAPTER FIVE

SECOND PUBLISHABLE PAPER

ASSOCIATION OF ILLNESS PERCEPTION AND ADHERENCE WITH BLOOD PRESSURE IN ADULTS WITH HYPERTENSION IN RURAL CHINA

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Abstract

Despite the high prevalence of hypertension in China, the control rate is low. Identifying variables that support blood pressure control is critical. The association of personal characteristics and treatment adherence with blood pressure has been reported, however, less is known about illness perception. This cross-sectional correlational study of rural adults with hypertension in China examined the association of blood pressure with personal and illness characteristics, illness perception, and medication and self-management adherence. Data were collected from 163 adults with hypertension in two Chinese villages. Measures included a demographic questionnaire, the Chinese Illness-Perception Questionnaire-Revised (CIPQ-R), Medication Adherence Inventory, and the Inventory of Adherence to Self-management. Hierarchical regression was used to assess the association between blood pressure and significant variables identified in bivariate analysis. The samples mean systolic pressure was146.59 mmHg and the diastolic mean was 80.52mmHg. None of the variables analyzed were associated with systolic blood pressure. Gender, age, and household annual income were associated with diastolic blood pressure, explaining 23% of the variance in the regression model. Illness coherence contributed an additional 2%. These findings suggest that (a) healthcare providers should focus on educating rural hypertensive adults about healthful diets and behaviors to manage hypertension, especially for the group with high household income; (b) knowledge-based health education alone is not adequate; (c) illness perception may not be directly associated with blood pressure and; (d) the CIPQ-R and ISMA require

validation and potential revision for use with rural Chinese populations. Limitations included measures which may require higher levels of literacy, potential social desirability responses, and limited generalizability.

Key words: hypertension, illness perception, illness representation, adherence, Chinese

Introduction

Hypertension (HTN), defined as systolic blood pressure (SBP) ≥ 140mmHg or diastolic blood pressure (DBP) ≥ 90mmHg (Roumie et al., 2011; Z. Sun et al., 2010), is a health challenge prevalent not only in Western cultures, but also in rural China. Studies conducted in different regions of China have indicated a high prevalence of hypertension. Data from a national survey conducted in 2011 - 2012 among 13,707 adults showed that nearly 40% of Chinese people aged 45 or older had hypertension (Feng et al., 2014). A study with 46,923 adults in rural northern China reported a 30% prevalence of hypertension in men and 23.4% in women (Z. Sun et al., 2010). Feng et al.,(2014) reported that of the individuals with hypertension, more than 40% did not know their condition, 50% received no medication, and 80% were inadequately controlled. Such a high rate of uncontrolled blood pressure is a challenge for public health. Although much is known about hereditary and lifestyle factors predictive of HTN, little is known about what makes a person with HTN adhere to HTN treatment recommendations. Understanding such factors can guide the development of strategies for improving BP control.

Background

Multiple factors are known to be associated with HTN. Chronic diseases such as diabetes, previously diagnosed heart failure, peripheral artery disease, stroke, obesity, and lipid-lowering treatments affect blood pressure (Orozco-Beltrán et al., 2008). The association between demographic characteristics and blood pressure differs. For example, among Asians, old age is associated with poor blood pressure control (Dong et al. 2008) and male gender with higher levels of systolic blood pressure among Chinese immigrants

in the United States (Li et al., 2010); high body mass index (BMI) is associated with uncontrolled blood pressure in Chinese and elderly men in South Korea (Xu et al.,2013; H. S. Lee et al., 2010). Another Chinese study reported that poor blood pressure control occurs among those who are young, living in urban areas, have low educational attainment, and are overweight or obese (H. Wang et al., 2013).

Illness perception, or a layperson's beliefs about illness (Hagger & Orbell, 2003) is another factor that may influence blood pressure control. The association between illness perception and clinical outcomes in other diseases were reported in studies from Americans, Europeans, and Asians (Groarke et al., 2005; Y. Kim, C. Pavlish, S. L. Evangelista, D. J. Kopple, & R. L. Phillips, 2012; Scharloo et al., 2007; N. L. Sun et al., 2012)These studies have shown relationships between illness perception and illness outcomes such as quality of life, self-care behavior, and illness-specific indicators (e.g., physical function and pain). In hypertension studies, illness perception has been reported to be associated with adherence to medication and self- care activities (S. L. Chen et al., 2014; S. L. Chen et al., 2009; M. J. Figueiras et al., 2010; Pickett et al., 2014). Living arrangements and length of diagnosis have not been reported in the literature as variables related to blood pressure in Chinese samples. These variables, however, were also found to be associated with medication adherence in a sample of adults living in Taiwan (S. L. Chen et al., 2009). No studies, however, relate illness perception with the physiologic outcome of blood pressure.

Adherence to medication and self-management are regarded as significant

predictors of blood pressure control (Yue, Bin, Weilin, & Aifang, 2015). As previous research from diverse geographic locations found (Bosworth et al., 2010; Li et al., 2010; Matsumura et al., 2013), so also in a sample of 232 Chinese, Yue observed that adherence to antihypertensive medications was significantly associated with better systolic blood pressure after adjusting for socio-demographic, clinical, and patient-related factors (Yue et al., 2015). However, no association between adherence and blood pressure was reported by Yu et al., (2013). The association between self-management (or self-care) and blood pressure has seldom been investigated. An association between self-management and blood pressure, lasting for a short time, was reported by Korean researchers (Park, Chang, et al., 2013).

This evidence suggests HTN is prevalent even in rural China. It also indicates that self-management/self-care and illness perception may contribute to BP control. Thus, to fill a gap and to provide information to guide practice, this study will examine how these variables influence blood pressure.

Theoretical Framework

The Self- Regulation Model (SRM) proposed by Leventhal et al. (1984) theoretically supports illness perception as one potential independent variable for blood pressure outcome. The SRM suggests that individual beliefs affect coping and appraisal processes thus leading to illness outcomes. The model consists of three phases: First, individuals hold a cognitive and an emotional representation of the illness when facing the presence of illness. In the second phase, problem-based and emotion-focused coping

responses are developed to cope with the challenges. Finally, in the third phase, a continual appraisal of one's behavior and physical response is made to change the illness perceptions leading to a self-regulated coping response and influencing the outcome. Internationally studies have supported the usefulness of the model among patients with hypertension (S. L. Chen et al., 2014; S. L. Chen et al., 2009; Pickett et al., 2014). The research framework for this study, based on the SRM, is presented in Figure 3.

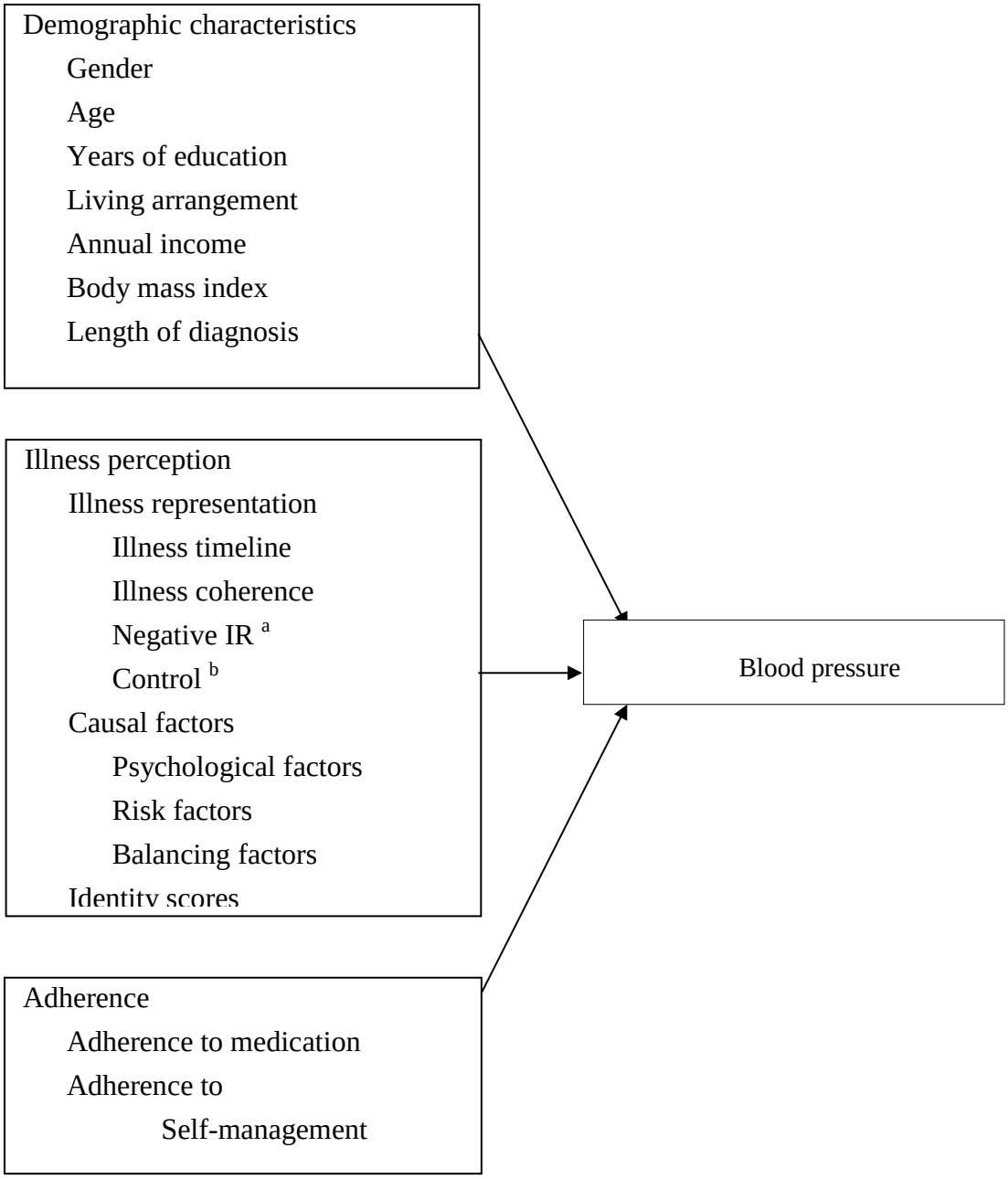

Figure 3. Research model for the study

[a] Negative IR: stands for negative illness representation including illness cyclical, emotional response, and consequence.
[b] Control: treatment and personal control.

The Study

Aim

This study examined the association of personal characteristics, illness perceptions, and medication and self-care adherence with blood pressure among rural adults with hypertension in mainland China. Specific research questions addressed in this report include: What is the relationship of personal characteristics, each variable of illness perception, and adherence to medication and self-management with systolic and diastolic blood pressure? And, what variables explain blood pressure?

Design

A cross-sectional correlational design using a self-report survey with a non-probability sample was used to answer the research questions posed.

Participants

Rural adults with hypertension were recruited in two villages in Zhejiang province in mainland China. The inclusion criteria were (a) be an adults 18 years and older; (b) have a diagnosis of HTN for a minimum of three years (systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg); (c) receiving (or have received) medication treatment and recommendation of self-management activities; and (d) be able to respond to survey questions either by reading and writing or verbally. Exclusion criteria were other significant chronic physical co-morbidities that involved pharmacological therapy. Of the 228 eligible people, 163 completed the questionnaires and had blood pressure, height and weight measured. Power analysis was conducted to determine a minimum sample size of 161which would achieve 80% power (alpha = .05) to judge significant an R^2 of 0.10 with 13 independent variables (Cohen, 1988).

Measures

Demographic and Health- related Characteristics

Data for gender, age, living arrangement, household annual income, years of education, and length of diagnosis were collected. Height and weight, using calibrated scales, were measured. The BMI was calculated by dividing weight in kilograms by squared height, in meters.

Illness Perceptions

The Chinese Illness Perception Questionnaire – Revised (CIPQ-R) was used to measure illness perception. This instrument was revised and validated for a Chinese population in Taiwan by (S. L. Chen et al., 2008) based on the Illness Perception Questionnaire-Revised by Moss-Morris, Weinman, Petrie, et al. (2002)**.** The CIPQ-R consists of three components, namely, illness representation (IR), causal attributions, and identity. The IR component included four subscales: timeline, illness coherence, negative illness representations, and control with a total of 35 items. All items are rated on a five-point response scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Eleven negative statements were reverse scored. A higher score indicate stronger belief in the statement. Subscale coefficient alphas ranged between 0.65 - 0.87 in the (S. L. Chen et al., 2009) study, with the lowest value found in the treatment control subscale. The subscales also showed convergent and discriminant validity. In the current study, the Cronbach's alphas for CIPQ-R ranged from 0.48 - 0.85; similarly, the treatment control subscale presented the lowest score. The composite scores resulting from the control scores (personal control + treatment control) and the negative IR (consequence + timeline cyclical + emotional response) were used in the analysis as suggested by (S. L. Chen et

al., 2008). Using composite scores resulted in Cronbach's alphas of 0.63 - 0.76. The lowest score was found for illness coherence.

The causal component consists of 18 items with four subscales, namely, psychological factors, risk factors, balancing factors, and cultural attributions. The items are rated and interpreted in the same way as that of IR component. Participants were asked to write down three main attributions they thought caused hypertension to detect the unique cultural influence. For the current study, data were collected and factor analysis was run for the causal component as suggested by Moss-Morris, Weinman, Petrie, et al. (2002). The item of "poor medical care in the past" loaded on psychological factors, which is not conceptually appropiate. In the Taiwanese study, this item loaded on balancing factors. Therefore, we deleted this item from the causal subscale and conducted the second factor analysis. The total variance explained increased from 53.00% to 54.83%. As a result, 17 items remained with Cronbach's alphas ranging from 0.63 - 0.78.

The identity component was measured by asking the participants to rate, as either *experienced* or *not experienced,* 30 possible hypertension related symptoms. For the symptoms experienced, participants rated whether the symptoms were hypertension-related. Each symptom experienced and checked as related to hypertension was given one point. The sum of points was the score for the identity component. The more symptoms related to hypertension experienced, the higher the score,.

Medication Adherence Inventory

The Medication Adherence Inventory (MAI) developed by S. L. Chen et al., (2009) includes 13 items with three subscales: decrease type of dosage deviation, increase type of dosage deviation, and unintentional dosage deviation including taking

medication intermittently, drug holiday, and deviation in timing. The item response options for MAI are *never* (in the past month), *occasionally* (1 to 2 days in the past month), *sometimes* (3 days in the past month), *often* (4 to 5 days in the past month), and *always*. The scores are given from 1 (*never*) to 5 (*always*). The scores of negative statement are reversed. Higher scores indicate higher adherence. (S. L. Chen et al., 2009) reported a good reliability of 0.89 for the total MAI scale and 0.85, 0.87, 0.91 for un-intentional, increase type and decrease type subscales, repectively. For the current study, MAI subscales revealed overall Cronbach's alpha of 0.88. Considering the sample size and in order to minimize the number of independent variables, we used the MAI as a total scale, rather than the three subscales as it was used in the previous study (S. L. Chen et al., 2009).

Inventory of Adherence to Self-management (IASM)

The IASM, included 11 items in three subscales and was developed by (S. L. Chen et al., 2009) to measure healthy diet, unhealthy diet, and exercise. The item response options and scores are the same as for the MAI. The internal consistency alphas were 0.70 (for the scale total) and subscales, healthy diet, unhealthy diet, and exercise, were 0.70, 0.72 and 0.96 respectively. In the current study, the Cronbach's alpha for the entire scale was 0.65, which is lower than in the previous study (S. L. Chen et al., 2009)but is acceptable.

Each category of demographic data, subscales of CIPQ-R, medication adherence and adherence to self-management were used as independent variables for the current study.

Blood Pressure

The value of SBP and DBP in determining the stage of hypertension and eligibility for treatment remains controversial. Acumulated evidence has demonstrated that SBP is a good indicator for cardiovascular risk for CVD, mortality from a stroke, and chronic heart disease (Strandberg & Pitkala, 2003; Tin et al., 2002). SBP is also used to determine HTN stage and eligibility for HTN treatment (Lloyd-Jones et al., 1999). Nevertheless, Tin et al. (2002) argued that until evidence becomes available, DBP also should be used to determine stage and eligibility for the treatment. Thus, both SBP and DBP were included in the current study. Blood pressure was measured twice, at one minute apart, using a calibrated digital sphygmomanometer. The mean of the systolic and diastolic blood pressure readings were used as the outcome variables.

Ethical Considerations

Permission to access the study sites and health files was granted by the president of the health care center for the villages. Approval to conduct the study along with a waiver of signed informed consent was obtained from the Institutional Review Board (IRB) of a health sciences university in the United States. A nurse administrator affiliated with the local Chinese university provided a letter supporting the cultural appropriateness of the study and served as a the IRB local contact for the study. Prior to data collection, a list of potential eligible participants was gathered through health file review. Telephone contact was made to ask for their willingness to participate in the study and an appointment for data collection was made. Before the face-to-face interview started, oral consent was obtained after the study purpose was explained and the potential participants'

right to refuse was underscored. Confidentiality was protected by keeping the completed questionnaire and participants' identifiers in separate protected files.

Data Collection

Data were collected between October 2014 and January 2015 at the health care center of each of the two villages. After obtaining oral consent, the first author or one of three trained research assistants measured the weight, height, and blood pressure. Next, the participants were asked to complete the questionnaires. Each item in the questionnaires and the personal information form was read by a member of the research team to the majority of the participants and their responses to the questionnaires were recorded. Potential participants who had difficulty in verbal communication or were unable to respond to the survey questions, were told that they were not eligible to participate and thanked for their willingness. Completion of the personal information form and the questionaires took approximately 45 minutes to one hour. Data collection took approximately 10 minutes longer for those who were unable to read and write.

Data Analysis

Data were analyzed using SPSS version 21.0. Internal consistency of the CIPQ – R, IAM, and IASM subscales were evaluated using Cronbach's *alpha*. Variable means were compared using independent *t*-tests to determine systolic and diastolic blood pressure mean differences on categorical variables such as gender, marital status, employment status, and living arrangement. Pearson's *r* (correlation) was used to explore the relationship between systolic and diastolic blood pressure and all continuous data such as age, years of education, yearly income, length of diagnosis, BMI, timeline, illness

coherence, negative illness representation, control, adherence to medication and self-management.

Hierarchical regression analysis was conducted to determine the association between the independent variables and the systolic and diastolic blood pressure. Only significant, or close to significant, variables in bivariate analysis were entered in the regression analysis.

Results

Demographic and Health-related Characteristics

Of 220 potential eligible participants, 28 were not able to be contacted, 5 were not communicate due to a language barrier, and 24 were either diagnosed with other chronic diseases or refused to be interviewed. As a result, 163 were interviewed, of which, 69 (42.30%) were males and 94 (57.70%) were females; 134 (82.20%) were married, the others were single, divorced, or widowed. One-hundred-forty-four (88.30%) were living with family whereas 19 (11.7%) lived alone. Sixty-nine (42.30%) were unemployed and the others either worked on farms (19.10%), in a workshop (13.50%), office (4.90%), or at other sites (20.20%). On average, the participants were aged 65.63 (*SD* = 10.61) years. For this sample, the mean body mass index was 24.58 (*SD* = 3.51), and the mean systolic blood pressure of 146.59 mmHg (*SD* = 16.87) and mean diastolic blood pressure of 80.52 mmHg (*SD* = 12.64) were observed. The median years of education was five (ranging from 0 to 14); 35 participants (21.5%) had received no formal education. The median household income was 24,000 yuan (ranging from 1,200 to 500,000), and the average length of time since HTN diagnosis was 9.81 (*SD* = 6.17) years. One-hundred-thirty (79.80%) of the sample reported taking one type of hypertensive medication, 31 (19.00%)

reported taking two or more types of medication, and two (1.20%) reported no medications but did use herbs to control blood pressure.

Assessing Significance of Demographic Variables on Blood Pressure

Table 7 presents the association of gender, marital status, employment status, and living arrangement with both SBP and DBP. There was no significant difference in the systolic blood pressure between all above categorical groups. For DBP, however, there was significant difference between gender and employment groups. Males had a higher mean DBP reading, and those who were employed had a higher DBP than the not employed group. Age, annual household income, years of education, length of diagnosis, and BMI had no statistical significantly correlation with SBP. Age, household annual income, and years of education, however, had significant correlation with diastolic blood pressure (see Table 8). The older the age, the lower the DBP was. Higher income, more years of education were correlated with higher DBP.

Table 7. *Association of personal characteristics with blood pressure (N =163, df=161)*

Variables		Systolic blood pressure	Diastolic blood pressure
Gender	Male	147.14 ± 16.78	85.54 ± 12.75
	Female	146.18 ± 17.00	76.84 ± 11.27
	t (161)	.36	4.61
	p value	.61	.00
Marital Status	Married	146.22 ± 17.41	81.18 ± 12.79
	Not married	148.28 ± 14.12	77.47 ± 11.63
	t (161)	- .59	1.44
	p value	.55	.15
Employment status	Not employed	146.94 ± 16.88	78.58 ± 12.51
	employed	146.03 ± 16.96	83.60 ± 12.31
	t (161)	.33	- 2.51
	p value	.74	.01
Living arrangement	Live alone	146.59 ± 17.27	77.23 ± 12.21
	Live with family	146.58 ± 13.85	80.95 ± 12.67
	t (161)	- .02	- 1.21
	p value	1.00	.23

Assessing Association of Illness Perception and Adherence with Blood Pressure

Pearson's *r* analyses showed that subscales of illness representation (i.e., causal factors, medication adherence, and self-management adherence) had no significant relationship with SBP. Higher mean score of illness coherence and risk factor, however, were significantly related with higher DBP (see Table 8).

Table 8. *Bivariate relationship between study variables and blood pressure (N = 163)*

Variables	Systolic blood pressure		Diastolic blood pressure	
	r	*p*	*r*	*P*
Age	.72	.36	- .33	.00
Years of education	.21	.79	.31	.00
Length of diagnosis	.09	.25	- .05	.53
Household income	.05	.53	.33	.00
Body mass index	.03	.60	.04	.63
Illness representation				
Timeline	.01	.93	-.02	.82
Neg.IR[a]	-.02	.77	-.07	.35
Control[b]	.01	.86	.06	.42
Coherence	.11	.17	.23	.00
Causal				
Psychological	.03	.74	-.06	.46
Balance	.13	.09	-.07	.36
Cultural	-.03	.75	.08	.32
Risk	-.10	.18	.24	.00
Adherence				
Medication	-.12	.14	-.08	.29
Self-management	.02	.77	.04	.62

[a] Neg. IR, negative illness representation. [b] Control, personal and treatment control

Table 9. *Hierarchical regression model for the association between diastolic blood pressure and personal characteristics and illness perception (N = 163)*

Step	Variables	Beta[a]	R^2 Change	*Adjusted* R^2
1	Personal characteristics		.23***	.21
	Gender	-.23**		
	Employment status	-.09		
	Age	-.22*		
	Household income	.21**		
	Years of education	.00		
2	Illness representation		.02*	.23
	Illness coherence	.16*		
3	Causal attribution		.00	.22
	Risk factor	.07		
	Cumulative R^2 Change		.25	

Betas shown are for the last step. *p< .05 **P<.01 ***P< .001

Regression Analysis for the Association of Diastolic Blood Pressure and Independent Variables

Because bivariate analysis revealed that none of the independent variables were associated with systolic blood pressure, hierarchical regression was employed only to analyze whether the independent variables were predictive of diastolic blood pressure (DBP). Gender, employment status, age, household annual income, and years of education were entered in the first block. Illness coherence was entered in the second block, and then risk factor was entered last. Collinearity was assessed and showed that bivariate associations between all independent variables were less than 0.5, tolerance for all independent variables was more than 0.2, and variance inflation factor (VIF) was less than 10. The assumption of no collinearity, thus, was assumed. Table 9 displays the regression outcomes. The first model explained 23% of the variance, with household annual income, gender, and age as significant variables associated with diastolic blood

pressure. The second model with illness coherence added an additional 2% of the variance. The third model with risk factor was not a significant model (see Table 9).

Discussion

The current study found several demographic characteristics such as age, gender, household income, and illness coherence and risk factors to be associated with diastolic blood pressure (DBP), but none of the studied variables, including adherence to medication and adherence to self-management, were associated with systolic blood pressure (SBP). Among all studied variables, personal characteristics play an important role in DBP.

Demographic Characteristics and Blood Pressure

Hierarchical regression showed that gender, age, and household annual income were associated with diastolic blood pressure (DBP). The demographic and health-related characteristics, including gender, marital status, age, living arrangement, years of education, length of diagnosis, household annual income, and BMI, had no association with SBP in the current study. It was reported that higher income was found to be associated with lower treatment among rural Chinese people due to their busy work life (Dong et al., 2008). On the other hand, in China, especially in rural areas, people with more income can afford to eat more expensive food with richer protein and fat. This may cause the hardening of blood vessels leading to higher resistance of the peripheral vessels and elevate the DBP (Tin et al., 2002). In addition, low salt, low fat, and higher fiber diet has been found to be associated with better control of blood pressure (Li et al., 2010).

The current study found that age was negatively associated only with DBP, which supports the idea that DBP reflects the peripheral resistance and stabilizes or declines with advancing age (Tin et al., 2002). In a previous Chinese study, older age (45 and above) was found to be related to better blood pressure control (both SBP and DBP) among the hypertensive individuals (N = 5,227) receiving treatment in a study with 17,437 participants in Shanghai (mean age of 58.09) (H. Wang et al., 2013). On the contrary, old age was associated with poor blood pressure control in a study of 45,025 rural Chinese hypertensive adults aged 35 to 85 (Dong et al., 2008).

In our study, gender was significantly associated with DBP, but not associated with SBP. Male adults presented higher DBP than female. The association between gender and DBP was also reported by (Li et al., 2010), but not by Wang et al. (2013). Association between being overweight or obese and poor blood pressure control was reported in a Chinese study (Xu et al., 2013) and a Korean study(H. S. Lee et al., 2010). Our study did not find the association between BMI and blood pressure. The mean BMI in the current study was 24.58 which is considered overweight in mainland China. No obesity was found among the participants. This lack of variance may explain why BMI had no association with blood pressure in the current study.

The association between education and DBP disappeared in the regression model in the current study, which is consistent with the findings reported by Dong et al. (2008). A recent Chinese study reported by H. Wang et al. (2013) indicated that less education was associated with inadequate blood pressure control among Chinese adults with hypertension. In summary, age, gender, and household income are associated with DBP, not with SBP in this sample, while previous studies found them associated with blood

pressure. The phenomenon may be more complex than presently understood; therefore, further study among Chinese adults with hypertension is needed.

Illness Perception and Blood Pressure

No statistically significant relationships were found between systolic blood pressure and levels of any measures of illness perception in the current study. Illness coherence, however, is a single variable of illness perception associated with diastolic blood pressure. Higher scores of illness coherence means better understanding of the illness. However, illness coherence was associated with higher DBP after controlling the demographic and health-related characteristics variables in our study. This may show that the cognitive awareness of the illness does not necessarily result in a better disease outcome. Other factors may deter people from adopting appropriate healthcare behaviors that would manage the disease. Illness perception has been studied in many diseases (Hagger & Orbell, 2003). However, most illness perception studies conducted in hypertensive population were performed to assess the relationship between the illness perceptions and coping strategies such as adherence. According to Leventhal et al. (1997), illness perceptions influence disease outcomes through coping strategies. Therefore, understanding the illness alone may not be adequate for blood pressure control. Efforts to educate the public with only the knowledge of hypertension are not enough. Health providers need to emphasize knowledge and behavior change in order to educate adults to manage their hypertension. This finding suggests that the association between illness perception and blood pressure control may not be existed in this sample population and further investigation is recommended.

Adherence to Medication or Self-management and Blood Pressure

Previous studies on adherence to antihypertensive drug and self-management have reported an association between adherence and blood pressure control (Bosworth et al., 2010; Li et al., 2010; Matsumura et al., 2013; Yue et al., 2015). The inconsistent findings of the present study compared with those of previous studies indicated that neither medication nor self-management adherence were associated with blood pressure. The findings may have resulted due to two reasons. First, adherence data were collected using a self-report format. Self-reported adherence may be higher than the actual practice due to social desirability, as was reported by (Li et al., 2010)in a study with Chinese immigrants in the United States. In the current study, some participants tended to select any value from one to five to answer Likert items, therefore the number selected may not have represented their actual practice. Given this situation, the self-reported medication adherence may not be reliable. Secondly, the premise that higher adherence leads to improved blood pressure control assumes effectiveness of antihypertensive medications and self-management activities. The effectiveness of medication depends on the proper selection of the medication. In rural China, it is possible for the patients to purchase the medications over the counter without professional recommendation. In addition, the effectiveness of medication is not evaluated by the health professionals if they do not follow-up with the clinic. To make it worse, health professionals in the rural clinic may be insufficiently skilled (Feng et al., 2014). Nevertheless, high adherence to non-effective medications will not result in hypertension management. In addition, self-management in the current study consisted of questions about healthy and unhealthy diet and exercise. For example, two items in the questionnaire asked about canned food, a term which may

not translate to rural China. Such questions may not be culturally fitting for this sample, thus, leading to concern regarding the validity of some items for this population. It is also possible that canned foods are not consumed as much in this population.

Study Limitations

This study had several limitations. First, generalizability was limited due to the small convenience sample. The number of participants met the minimum sample size requirement but variance was limited for some variables. Second, the CIPQ-R was modified to Chinese by the researchers in Taiwan (S. L. Chen et al., 2009) .For the current study, the CIPQ-R was changed from old Chinese characters to simplified Chinese characters, without changing the meaning of the statement. However, there may be some word differences between Taiwan and mainland China. The statements in the illness perception questionnaires were not easily understood, especially the negative statements, particularly by people with limited educational background. Modification and validation of CIPQ-R is recommended for the rural Chinese population. Further study is recommended using a revised CIPQ-R to determine the association between illness perception and blood pressure control. Third, self-reported medication adherence was high with a mean score of 4.63 (out of 5) in the current study. This may be caused by the participants' desire to please the researchers or public health providers. The participants' prompt and positive answers to adherence items suggested the threat of social desirability. The foods referred to in the Inventory of Adherence to Self-management were not as typical as those used in mainland China. For example, seasoned or canned foods do not carry the same labels or names in mainland China. Due to these observations it is recommended that the questionnaires used in any similar study be meticulously reviewed

for cultural relevance and be validated with rural populations before further use in mainland China, particularly for use with less educated populations. Finally, the data were collected in two small rural villages, thus limiting generalizability to similar populations. In addition, the cross-sectional design of this study could not establish the predictive relationship between the variables.

Conclusion

Given that many Chinese rural adults live with uncontrolled blood pressure, it is vital to determine the factors associated with blood pressure control. Our study found older age was associated with lower DBP, and male hypertensive adults, higher income, and more understanding of hypertension were associated with higher DBP. The findings prompt the following suggestions. First, healthcare providers need to consider that with the improved economy there may be more fast foods or processed foods available which are not good for health. Therefore, rural hypertensive adults may need more education on a healthful diet and behavior change to adequately manage hypertension. Secondly, knowledge-based health education programs alone are not adequate. Cognitive awareness does not guarantee the behavioral changes, thus further comprehensive programs focusing on behavior changes are needed. When providing health education to populations that have limited education, healthcare providers should consider the health literacy needs of these adults and appropriately adapt educational programs.

Thirdly, illness perception may not have direct association with blood pressure, since only illness coherence was found to be associated with DBP. The Self-Regulation Model may provide a useful framework in explaining the blood pressure control among hypertensive patients, if coping strategies were considered. Finally, revising and

validating the CIPQ-R for Chinese with limited education is recommended as a primary need for the rural populations.

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Additional Findings

Factor Analysis for Causal Component

Conducting a factor analysis was suggested by the original authors of the Illness Perception Questionnaire - Revised in order to group the items of the causal component (Moss-Morris, Weinman, Petrie, et al., 2002). Therefore, a factor analysis using Principle Component Analysis (PCA) with Varimax Rotation was conducted on the 18 items of the causal component. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = 0.75 (Hutcheson and Sofroniou, 1999). Bartlett's test of sphericity = 883.84, ($p < .001$), indicated that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Four components had eigenvalues over "1" and in combination explained 53% of the variance. Table 11 depicts the factor loadings for causal scale with 18 items. The items that clustered on the same components suggested that component 1 represented psychological factors (7 items), component 2 represented balancing factors (5 items), component 3 is identified as cultural factors (3 items), and component 4 as risk factors (3items). The item "Poor medical care in the past" loaded on component 1. Conceptually, this item should be loading on component 2, balancing factors. Therefore, PCA was run again without this item. KMO = 0.75; Bartlett's test of sphericity = 785.94 ($p = .000$), indicated that correlations between items were sufficiently large for PCA. Four components had eigenvalues over "1" and in combination explained 54.82% of the variance resulting in a slight improvement. Table 12 depicts the factor loadings after rotation. In summary, the factor analysis demonstrated a good construct validity for the current study.

Table 10. *Factor loading for exploratory factor analysis with varimax rotation of causal attribution scale with 18 items* (*N* = 163)

Scale	1	2	3	4
My mental attitude e.g. thinking about life negatively	**.69**	.20	.26	.01
My emotional state	**.67**	.38	.06	.04
Family problems or worries caused my illness	**.65**	.12	.03	-.06
Stress or worry	**.60**	.21	.18	-.07
My life pattern	**.54**	-.01	.02	.36
My personality	**.54**	.10	.16	-.05
Poor medical care in my past	**.44**	.20	.31	.10
Change of the weather	.03	**.82**	.07	.09
Poor sleeping pattern	.09	**.69**	.18	.07
Dry and warm inside body or poor gas and blood circulation	.23	**.66**	-.10	.30
Altered immunity	.24	**.54**	.14	-.17
Overwork	.35	**.51**	.01	-.02
Bad year or disharmony	.23	-.00	**.84**	.05
My fate	.13	.12	**.84**	-.01
Chance or bad luck	.18	.14	**.70**	.05
Smoking	-.05	.01	.16	**.87**
Alcohol	-.13	.01	.09	**.82**
Diet or eating habits	.22	.17	-.15	**.49**

Note. Factor loadings > .40 are in boldface. 1= psychological factors; 2 = balancing factor; 3 = cultural factors; 4 = Risk factors

Table 11. *Factor loading for exploratory factor analysis with varimax rotation of causal attribution scale with 17 items* (*N* = 163)

	1	2	3	4
My mental attitude e.g. thinking about life negatively	**.71**	.20	.27	.02
Family problems or worries caused my illness	**.68**	.11	.04	-.05
My emotional state e.g. feeling down, lonely, anxious, empty	**.66**	.39	.07	.05
Stress or worry	**.59**	.23	.19	-.07
My personality	**.59**	.07	.17	-.03
My life pattern	**.54**	.01	.02	.36
Change of the weather	.03	**.81**	.09	.10
Poor sleeping pattern	.09	**.67**	.19	.08
Dry and warm inside body or poor gas and blood circulation	.22	**.67**	-.10	.30
Altered immunity	.22	**.56**	.14	-.17
Overwork	.29	**.55**	.01	-.03
Bad year or disharmony	.22	.01	**.84**	.05
My fate	.12	.12	**.84**	-.00
Chance or bad luck	.18	.14	**.71**	.05
Smoking	-.05	.00	.15	**.87**
Alcohol	-.11	-.01	.09	**.83**
Diet or eating habits	.16	.22	-.16	**.47**

Note. Factor loadings > .40 are in boldface. 1= psychological factors; 2 = balancing factor; 3 = cultural factors; 4 = Risk factors

Other Findings

In addition to the above findings, data regarding the perceived causes for hypertension were collected. The participants were asked to list three causes for hypertension. The top four mentioned first causes were diet = 41 (25.10%), heredity = 33

(20.20%), aging = 16 (9%), and overworked = 15 (9.20%). The top four mentioned second causes were diet = 26 (15.90%), don't know = 16 (9.80%), overworked = 15 (8.90%), and heredity = 11 (6.70%). The first four mentioned third causes were don't know = 38 (23.30%), sleeping problem = 13 (7.90%), overworked 11= (6.79%), lack of exercise =11 (6.79%). Interestingly, overworked was frequently mentioned as a cause of hypertension. This may be due to the poor economic development in last few decades in rural China. People must work very hard to earn a living. The villagers thought that their early years of exhaustion from farming laid the pre-disposition for hypertension in later years. However, diet was recognized as the first cause of hypertension development. The participants verbalized that instead of eating plenty of vegetables they could now afford to purchase more meat and fatty food. Knowing diet as a risk factor for hypertension is a good sign for people to pay closer attention to avoiding unhealthy food.

Also, it is necessary to look at the most frequently rated hypertension-related symptoms. There were, however, 37 participants (22.70%) in the current study who rated no hypertension related symptoms. This finding is consistent with the asymptomatic nature of hypertension. Chinese rural adults frequently identified dizziness (N = 65; 39.9%) and fast heart rate (N = 56; 34.4%) as symptoms related to hypertension. Sore eyes were endorsed as hypertension related symptoms by 28% (N = 45) of the participants.

Summary of the Results

Chapter Four includes the findings for the current study conducted in the two villages in Zhejiang province of mainland China. The main findings include the relative low control rate of hypertension among those participants comparing with that in other countries, the description of demographic and health-related characteristics, illness perception, adherence to medication and self-management and determination of factors associated with blood pressure. Bivariate analysis showed that demographic and health related characteristics, illness perception, and adherence to medication and self-management had no association with systolic blood pressure, however some of those variables were associated with diastolic blood pressure. Additionally, a factor analysis was conducted to group the causal subscale of illness perception. With a deletion of one item from the subscale, 17 items were used in this study. Rural Chinese adults in two villages with hypertension frequently attribute the cause of hypertension to diet, being overworked, and symptom related to hypertension was frequently rated as dizziness and fast heart rate. In the final analysis, age, gender, household income, and illness coherence were associated with diastolic blood pressure explaining 25% of total variance in hierarchical regression model. These findings provided empirical evidence for the need of health education to enhance understanding of hypertension and a comprehensive behavior change program to empower villagers to improve hypertension management.

CHAPTER SIX

DISCUSSION

Introduction to Chapter

There are more than one in three adults in the world being diagnosed with hypertension ("World health day 2013," 2013). In China, the prevalence reaches 26.6% (Gao et al., 2013). Despite the availability of the health care and insurance coverage for the rural population; awareness, treatment, and control remains low (Feng, Pang, & Beard, 2014).The factors influencing awareness, treatment, and control need to be identified for the management of hypertension. The purpose of this study was to examine the relationship among demographic and health-related characteristics, illness perception, and adherence (adherence to medication and to self-management) and blood pressure in a sample of rural dwelling adults with hypertension in Zhejiang Province of China. The aims of this study include: a) describe the demographic and health-related characteristics, levels of illness perception, medication and self-management adherence, and SBP and DBP in the study sample; b) examine the association between demographic and health-related characteristics and blood pressure; c) examine the relationship between illness perception and blood pressure; d) examine the relationships of adherence to medication and adherence to self-management with blood pressure; e) determine how well the demographic and health-related characteristics, illness perception, and medication and self-management adherence predicts blood pressure.

In this chapter a summary of the findings and a comparison of the findings with research literature is presented. Finally, the strength, limitations, and implications of the current research are delineated.

Summary of the Findings

Hypertensive participants18 years and older from two villages in Zhejiang province in the mainland of China were recruited for this study. Of the 220 eligible candidates, 163 completed the questionnaire, with a 74% response rate. Of the 163 participants, 57.7% were female and 42.3% were male. Most of the participants obtained less than six years of education. The average age of the participants was 65.53 (*SD* = 10.61) and the average length of diagnosis was 9.81 years. The majority of the participants were married and lived with their family. The SBP (146.59 mmHg) was not well controlled for this group, but DBP presented a good mean score (80.52 mmHg). The overall blood pressure control rate was 28.80% (*N* = 47) and average body mass indicator (BMI) of the participants was 24.58.

Illness perception was measured with the four subscales of illness representation (timeline, control, negative illness representation, and illness coherence), four subscales of causal factors, and identity score.

The highest mean score in illness representation subscale was found in the timeline and control subscales indicating that this group of pariticipants believe hypertension was a chronic disease and controllable through personal and treatment efforts.

Among all causal factors, the highest mean score was found in the balancing factor. The participants did not attribute biomedical explanations as the cause of hypertension but instead endorsed balancing factors as the predominate cause for

hypertension. The balancing factors included being over worked, having poor sleeping patterns, changes in the weather among other factors. These factors were attributed to their hypertension followed by risk factors and cultural factors. In addition, the participants were asked to list three causes for their hypertension. The participants frequently indicated that diet, being overworked, heredity, and sleeping problems were the cause for their hypertension.

In the current study, the participants rated only 4.33 symptoms as hypertensive related symptoms, which suggested many of the participants experienced no symptoms at all. Medication and self-management adherence presented a high mean score indicating high adherence.

Bivariate analysis showed that all demographic data such as gender, marital status, employment status, living arrangement, age, length of diagnosis, years of education, household annaual income, and body mass index had no association with systolic blood pressure in this study. However, male and employed participants had higher DBP than females. Age, years of education, and household income were found to be correlated with diastolic blood pressure. None of the variables of illness perception was found to be correlated with SBP, but illness coherence and risk factor were found to be correlated with DBP. Medication and self-management adherence had no correlation with SBP or DBP. Among all demographic data, gender, age, and household annual income explained 23% of variance for DBP. No association was found between all illness perception variables and systolic blood pressure, but illness coherence was associated

with diastolic blood pressure ($p < 0.01$), which add an additional 2% variance. Risk factor, the only single factor among causal factors, was correlated with diastolic blood pressure in the bivariate analysis, but the association dispeared in the regression model.

A factor analysis for the causal component of illness perception was also conducted in this study. Four components, namely psychological factors (7 items), balancing factors (5 items), cultural factors (3 items), and risk factors (3 items) were extracted explaining 54.82% of variance. Age, education, body mass index, and household income were associated with illness perception and inter-correlations existed among the variables of illness perception.

In summary, the current research is the first to describe the illness perceptions of hypertensive rural dwelling adults in the mainland of China. None of the demographic data and variables of illness perception were associated with systolic blood pressure. The main factors influencing diastolic blood pressure were demographic characteristics.

Comparison of Key Findings with the Literature

The sample for this study was from a rural area in China. The participants were covered by the new Rural Cooperative Medical System (RCMS) insurance and received health care from the appointed health care providers. Despite the availability of health care and sufficient antihypertensive medications, the mean SBP (146.59 mmHg) in the current study suggested that 66.9% of study participants had inadequately controlled SBP while 33.1% had adequately controlled SBP. For DBP (80.52 mmHg), 35.2% of the participants had inadequate control. Overall, 47 participants (28.80%) had both SBP and DBP well controlled (below 140/90mmHg). This control rate is higher than the 18% reported by H. Wang et al. (2013) who included hypertensive adults in both rural and

urban areas of Zhejiang province. A hypertension study with an urban population showed a control rate of 11.8% (Cai, Liu, Zhang, Li, & Wang, 2012). Conversely, in a study conducted in the rural area of Liaoning province in China, the blood pressure control rate for newly developed hypertension was 1.5% (Sun et al., 2010). While yet another study conducted in rural China, found the control rate was 4.5% (Dong et al., 2008). These findings supported the conclusion that blood pressure control in studied population in rural China was higher than that of other areas in China. This may be due to the health care reform conducted by Chinese government in 2009. As part of the reform, a national primary care program, national medicine system and universal health insurance were available for Chinese people (Feng, et. al., 2014). However, the blood pressure control rate among this studied population is still lower than that of Taiwan. Li and colleagues (2012) reported 50% of control rate among the participants in the clinic. Thus, further effort is needed to achieve better control of blood pressure for the rural adults studied.

In the current study, the majority of the sample showed a SBP over 140 mmHg, but most had better controlled DBP. We found that the SBP had no association with any demographic and health-related characteristics, variables of illness perception, or adherence to medication and self-management. These findings differ from the findings of previous studies (W. W. Li, Wallhagen, & Froelicher, 2010; Matsumura et al., 2013; Shaw & Bosworth, 2012; Yue, Bin, Weilin, & Aifang, 2015). For example, adherence to medication was found to be significantly associated with better SBP control in a study conducted in Shanghai with 232 hypertensive patients (Yue et al., 2015). Self-management was rarely reported to be associated with blood pressure control, but Park, Chang, Kim, and Kwak (2013) reported association of self-management with both

systolic and diastolic blood pressure control, which lasted for only a period of time. Body mass index was found to be associated with blood pressure control (Feng et al., 2014; Lee et al., 2010; H. Wang et al., 2013; Xu et al., 2013). In other studies, old age was associated with poor blood pressure control (Dong et al., 2008). Male gender was found to be significantly associated with higher levels of systolic blood pressure (W. W. Li et al., 2010). Low education attainment was associated with higher blood pressure (H. Wang et al., 2013).

Our study found that the participants adhered to medication and self-management activities were high. Adherence is thought to be effective in SBP control, but surprisingly, the mean SBP in this study was more than 140 mmHg. Mancia and Guido (2002) concluded from a review of several antihypertensive drug trials that optimal systolic blood pressure was hard to achieve, even when the compliance to medication and the expertise of physician were adequate. This may be due to the hardening of the large artery wall that caused the elevation of systolic blood pressure. The average SBP in this study wasn't much higher than 140mmHg, therefore, it might be the case pointed out by Mancia and Guido (2002). However, some researchers have reported the insufficient expertise of the physicians in Chinese rural areas (Feng et al., 2014). To achieve adequately controlled blood pressure, investigation on the potential insufficient expertise of the physicans in the villages is needed before developing any interventions. It may be important to develop public health strategies involving physician training along with improved patient education that matches the literacy levels of the populations served to enhance the management of hypertension in the village population.

In our study, DBP was associated with demographic characteristics such as age,

gender, education level, and household income in the bivariate analysis. The hierarchical regression analysis showed that age was a significant predictor for DBP and was inversely related to DBP. This finding is supported in the literature. DBP increases with age up to 55 years, and then decreases (Strandberg & Pitkala, 2003). With an average age of 65.63 years in the current study, improved control of DBP could be explained through the natural changes of aging. In our study, females had better DBP control: a finding supported by others (King & C, 2006; W. W. Li et al., 2010).

The association between educational level and DBP disappeared in the regression model in the current study. Findings from Dong et al. (2008) study supported our findings. However, some other studies reported contradictory findings. For instance, low educational level was associated with poor SBP and DBP control (H. Wang et al., 2013). Understanding hypertension may be limited when the participants have received less education.

Household income was found to be associated with DBP in this study. This finding might reflect the increasing affordability and consumption of expensive foods that are rich in fat, thus increasing cholesterol and leading to the change of the wall of the large artery which causes elevated DBP.

The results of the current study also showed that the majority of the participants were overweight (24.58 m^2/Kg) according to Chinese criteria for BMI judgement ("Criteria of weight for adults," 2013). As the economy in China has developed, some farmers who previously worked on farms are now either employed in the private companies or stay at home, thus greatly reducing the physical activities which should lead to less calorie consumption. On the other hand, the urban and westernized lifestyle

and food habits (Hou, 2008; Sun et al., 2010) following the advancing economy in China (Gao et al., 2013) may have contributed to the increased BMI among rural farmers. High BMI has been shown to be one of the factors that contribute to inadequate blood pressure control (W. W. Li et al., 2010; Xu et al., 2013). Even though the BMI in the current study was not found to be associated with blood pressure, there is plenty of other evidence to indicate the need to educate adults about the importance of the prevention of becoming overweight or obese in blood pressure control.

In understanding illness perception, we found that the highest mean score in the illness representation component was the timeline subscale indicating that the participants believed in the chronicity of hypertension. This finding is similar to previous studies (Chen, Tsai, & Lee, 2009; M. Figueiras et al., 2010; Ross, Walker, & MacLeod, 2004), but slightly different in a study conducted with an African American population (Pickett, Allen, Franklin, & Peters, 2014), in which, the participants held a neutral attitude about the chronicity of hypertension. In the African American study, only those who had hypertension for five years perceived the chronicity of hypertension. This finding differs from that in the current study. The different findings about the chronicity of hypertension between Chinese and African Americans may be due to the different age groups, as the mean age of Chinese participants was (65.63) about 15 years older than that of the participants in the African American study. With older age, people may estimate fewer years left to live, thus, viewing hypertension as a life-long disease. Additionally, this Chinese hypertensive sample had received health education regarding the chronic nature of hypertension. Believing in the chronicity of hypertension has been found to be associated with adherence to self-management behaviors (Chen et al., 2009; Pickett et al.,

2014). This adherence would theoretically lead to improved blood pressure control.

Similar to the previous studies (Chen, Lee, Liang, & Liao, 2014; Figueiras, Cortes, Marcelino, & Weinman, 2010; Pickett et al., 2014; Ross et al., 2004), the findings in the control subscale of illness representation suggest that the rural Chinese adults may have developed confidence in the control of hypertension through personal and treatment efforts. A meta-analysis review of 45 illness perception studies suggested that patients who perceived their illness as controllable tended to have better outcomes (Hagger & Orbell, 2003).

Compared with the mean score of illness coherence in the Taiwan study (Chen et al., 2009) and in other studies (M. Figueiras et al., 2010; Pickett et al., 2014), the mean score (2.68) in illness coherence of the participants in the current study was lower. Illness coherence was the only significant predicator among illness perception variables for DBP in this study. The current study found that illness coherence was negatively related to age and positively related with education. It also showed that females had higher illness coherence scores. Given the fact that this group of participants attained low education and were relatively older people, this may explain why a low mean score of illness coherence was found. The findings of low understanding of the disease suggest that basic health education on hypertension for the rural dwelling population is needed. Health providers needed to use very simple lay language in the delivery of health education content, particularly to the less educated, male, and elderly people.

The lowest mean score was found in negative illness representation (IR) which consisted of consequence, time cyclical, and emotional response. The low mean score suggested that rural dwelling hypertensive adults perceived less serious consequence

from hypertension, less variation in hypertensive symptoms, and less negative emotional responses. These findings are consistent with the Taiwan study (Chen et al., 2009). Previous research had suggested that patients with more symptoms are likely to perceive their illness as having serious consequences for their life leading to a more negative emotional response (Chen, Tsai, & Lee, 2008). In this study, the mode for the identity score was 2 with 37 participants reporting no hypertension related symptoms. This finding suggests that the majority of participants reported that they experienced only two symptoms as hypertension related and many attributed no symptoms to HTN. Given the above description of the relationship between experienced symptoms and serious consequences, the Chinese rural dwelling hypertensive adults who experienced fewer symptoms developed less negative IR to hypertension. On the other hand, illness perception is strongly influenced by individuals' social and cultural factors (Leventhal, Brissette, & Leventhal, 2003). Chinese people are considered resilient and tough, which may also contribute to the less negative illness representation. The lower perception of negative IR may result in less medical seeking behavior because Chinese people are likely to seek medical care based on how serious they perceive their illness. The perception of less serious consequences, variations of the illness and negative emotional reaction also suggest that more information regarding the consequence of hypertension is required for this population.

Study Strengths and Limitations

As already acknowledged in this dissertation, the prevalence of hypertension in China is a serious public health problem. Interventional strategies have been implemented with a hope to achieve better hypertension management, but the desired outcomes have

not been reached. Therefore, it is important to understand the factors associated with hypertension. The current study possesses several strengths. First, this is the first study to include illness perception as one of the factors influencing hypertension outcomes in China. As a result, illness coherence, one aspect of illness perception, was identified as a factor associated with diastolic blood pressure. This finding is informative for the development of teaching or counseling programs for the rural hypertensive populations. It suggests that understanding hypertension is not enough for hypertension control, behavioral changes are necessary. Second, this study includes measures of adherence to medication and self - management with illness perception as independent variables related to blood pressure control while previous studies have used the illness perception measure as an independent variable for adherence to medication or self - management. Thus, in the current study the direct association between illness perception and outcomes is found. Third, unique Chinese rural adults' explanations for the cause of hypertension were found by asking the participants to identify the causes of hypertension. Being overworked was the most frequently mentioned cause, suggesting that this sample misunderstands the true causes of hypertension. Thinking that being overworked as a cause of hypertension may prevent the study participants from active engagement in hypertension management.

The current research has several limitations to note. First, the sample size is relatively small which may have limited the ability to detect small statistical differences in the study sample. Secondly, the participants were recruited in two villages in one county, and the male/female ratio of the participants was slightly female-dominated. The purposive sample, size and composition limit the representativeness and generalizability

of the findings. The self-reported nature of data collection may have contributed to response bias due to social desirability. In addition, the Chinese Illness Perception Questionnaire–Revised was difficult for some of the farmers to understand and may have led them to give inaccurate responses. Finally, although the cross–sectional design of the current research found associations between personal characteristics and variables of illness perception, the predictive value of independent variables for blood pressure cannot be determined. To address this concern, longitudinal research is needed in the future. Even though better understanding of the disease ideally contributes to better control of blood pressure, our study found that the better understanding of the disease was associated with higher diastolic blood pressure. This finding suggests that understanding of a disease alone does not necessarily lead to better outcomes.

Implications

This study provides information about factors associated with blood pressure outcomes in a sample of rural dwelling adults in China. The demographic data including gender, employment status, and household annual income were significantly associated with diastolic blood pressure. Illness coherence and risk factors, however, were the only two subscales in The Chinese Illness Perception Questionnaire-Revised found to be significantly associated with diastolic blood pressure. Adherence to medication and self-management had no association with blood pressure. Despite the limitations mentioned above, the current study does provide some significant implications for theory, practice, and future research.

Implications for Nursing Theory

This study provides the empirical findings to indicate that some of the variables of

the illness perception have an association with diastolic blood pressure. According to the Self-Regulation Model, illness perception affects outcome variables indirectly through coping strategies (Leventhal, Nerenz, & Steel, 1984). Therefore, the direct association between the illness perception and outcomes is not determined. It also suggests that SRM may be a cultural specific and/or illness specific and may not be applicable for Chinese population. The current research, however, provides a good reference to further test the direct relationship between each variable, which can allow further refinement of the Self-Regulation Model.

Implications for Nursing Practice

Illness coherence was found to be associated with diastolic blood pressure in the current study. This finding indicates that Chinese rural adults do not understand hypertension. Previous Chinese research has found an extremely low level of hypertension knowledge among rural hypertensive patients (X. Li et al., 2013). The low mean score of illness coherence was negatively related to age and positively related with education. Thus, health providers who have direct contact with patients should be able to assess the patients' age, education level, understanding of hypertension, and make efforts to provide counseling or teaching for targeted groups to promote hypertension management. Health professionals should be aware that people with high household income may have poor blood pressure control. Persons with higher income can afford more expensive food, frequently the most expensive foods are rich in fat and protein, thus potentially contributing to increased blood pressure. Therefore, information about healthy lifestyle including dietary habits should be delivered to them through public media, counseling or teaching programs. From our study findings, we concluded that the

participants demonstrated a good understanding of the chronic nature and controllability of hypertension, but lacked knowledge of the consequence of hypertension and causal attributions of hypertension. This suggests that health education concerning about the knowledge of the consequence and causes of hypertension is needed. Furthermore, the counseling or teaching programs should not only be knowledge provision, but should also include opportunity for behavior change. In addition, we recommend that health providers become a role model for healthy lifestyle

Implications for Nursing Research

The current research provides a reference for further similar research projects, not only among hypertensive populations but other populations with chronic conditions. The questionnaire including MAI, ISMA, and illness perception scales require further validation for cultural sensitivity and local language. Especially, the CIPQ-R requires modification and validation to improve the internal reliability of the subscales with a rural Chinese population. From our experience, the Chinese rural dwelling population in these two villages who spoke different dialects and could not understand or respond appropriately to the questionnaires, thus, other research methods such as observation and interviews might be more effective for data collection. We also recommend having a person who speaks the local dialect to assist with communication.

In addition, health literacy is a strong predictor of health outcomes. A recent Chinese study found that the health literacy is generally low among Chinese adults, especially those living in rural areas (X. Wang et al., 2015). Further research is needed to understand the level of health literacy among the rural populations. Strategies need to be developed and tested to improve the health literacy of rural adults which may lead to

better outcomes in hypertension prevention and management. In the current study, adherence to medication and self- management was high, but the blood pressure was not well controlled. It suggests that future research is needed to find out the reason. If the inadequate control of blood pressure is caused by the potential insufficient expertise of the physicians in the villages, we can provide the recommendations to develop public health strategies involving physician training.

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APPENDIX A

APPROVAL FOR THE REVIEW OF HEALTH FILES AND DATA COLLECTION

健康档案查阅及研究许可

美国 Loma Linda 大学护理系博士研究生杨丽黎将在我卫生院管辖的两个村中开展以高血压患者为研究对象的科研项目。

高血压疾病在这两个村为多发疾病且发病率逐年上升，但村民对其知晓率及治疗依从性较低。杨丽黎已阐明其研究目的与方法，研究过程不会为当地居民带来任何伤害且研究数据保密，符合我国科研相关规定。其研究结果虽不会为村民带来直接利益，但能够为采取高血压控制的措施提供依据。

因此，本卫生院将大力支持杨丽黎的研究，允许她查阅高血压患者的档案，并在本中心诊室进行资料收集。

富春江镇卫生院院长：

2014.8.26

Approval for the Review of Health Files and Data Collection

Yang Lili, PhD student in Nursing of Loma Linda University will conduct a research among hypertensive adults in two villages under our care.

The prevalence of hypertension in these two villages has been increasing in recent years. However, low awareness rate and treatment compliance are observed among the villagers. Ms Yang Lili has already presented her research purpose and methods, which will do no harm to the local villagers and the collected data will be kept confidentially. Although the result of her study will not bring any direct benefits to the local people, it provides great evidence, with which hypertension interventions applies.

We, health center, therefore will give Ms Yang Lili full support by allowing her to review the health files of the hypertensive adults and providing her with the place and devices to collect the data.

President

Fu Chunjiang Health Center

Tonglu County, Zhejiang Province, PRC

E-mail: 2004wangding@163.com

APPENDIX B

A LETTER OF SUPPORT

To whom it may concern,

I am the VP for nursing of Sir Run Run Shaw Hospital. I have read through Yang Lili's dissertation proposal named "Factors Influencing Systolic Blood Pressure among Adults with Hypertensive in Rural China". The purpose of this study is to examine the relationships among demographic and illness characteristics, and adherence to BP treatment in a sample of hypertensive rural dwelling adults in Zhejiang Province of China. This is a cross-sectional survey involving self-administered questionnaires, BP, weight and height measures. The data will be collected in Yuzhao and Hengshan villages in Tonglu, Zhejing province. Permission from the direct of health care center to review the health files of the hypertensive adults will be obtained and a name list of the eligible participants based on the inclusion criteria will be made. The eligible participants will receive a telephone call from SI or one of the RAs who will briefly explain the purpose of the study. An appointment will then be made to at a mutually agreed upon time and place for data collection. Before the data collection, the participants will receive the detailed information about the study. The procedure is culturally appropriate.

Hypertension has been increasing dramatically in the past few decades. The awareness, treatment, and control rate of hypertension remains low and it has been a big challenge to the public health in China. Therefore, to find out the factors which influence blood

pressure control will be significant, especially for the public health education and health promotion.

I, hereby, am willing to be a local contact person to support Yang Lili and report any negative feedback and complaints from the participants to her dissertation committee at LLU.

My contact: yezh@srrs.com

Cordially yours

Ye Zhihong, RN, PhD

VP of nursing, Sir Run Run Shaw Hospital, School of Medicine, Zhejiang University

APPENDIX C

FIRST PAGE OF IRB APPROVAL

LOMA LINDA UNIVERSITY

INSTITUTIONAL REVIEW BOARD

RESEARCH PROTECTION PROGRAMS
24887 Taylor Street • Suite 202 • Loma Linda, CA 92350
(909) 558-4531 (voice) • (909) 558-0131 (fax)

Initial Approval Notice - Expedited ***IRB# 5140274***

To: **Winslow, Betty W**
Department: **Nursing Graduate Programs**
Protocol: **Factors influencing systolic blood pressure among rural hypertensive adults in China**

This study was reviewed and approved administratively on behalf of the IRB. This decision includes the following determinations:

Risk to research subjects: **Minimal**

Approval period begins: **10-Oct-2014** and ends **09-Oct-2015**

Stipulations of approval: **Waiver of signed consent per 45 CFR 46.117(c)(2)) and HIPAA authorization waived per 45 CFR 164.512 (i)(2)(ii).**

See attached list of items (if applicable).

See Appendix A for Conditions of Approval.

Adverse events and unanticipated problems must be reported in accord with the attached Adverse Event Reporting Matrix **A**.

All investigators are responsible for assuring that studies are conducted according to the approved protocol. Principal investigators are responsible for the actions of sub-investigators and staff with regard to this approval.

Please note the PI's name and the assigned IRB number, as indicated above, on any future communications with the IRB. Direct all communications to the IRB c/o Research Protection Programs. Thank you for your cooperation in LLU's shared responsibility for the ethical use of human subject in research.

Signature of IRB Chair/Designee: R L Rigsby Date: 10/13/14

IRB Chair:
Rhodes L. Rigsby, MD, MBA
Department of Medicine
(909) 558-2341, rrigsby@llu.edu>

IRB Administrator:
Linda G. Halstead, MA, Director
Research Protection Programs
Ext 43570, Fax 80131, lhalstead@llu.edu

IRB Analyst:
Anuradha Diekmann, MPH, CCRP
Research Protection Programs
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APPENDIX D

PHONE SCRIPT

- Hello, my name is Yang Lili with Loma Linda University's School of Nursing. May I speak to XXX?
- I would like to tell you about a research study that I am doing.
- Would it be convenient for me to talk to you about this study right now? (If not, set time for re-call.)
- The purpose of this study is to examine the relationship of demographic and illness characteristics, illness perception, and adherence (adherence to medication and adherence to self-management) with systolic blood pressure in a sample of hypertensive rural dwelling adults in Zhejiang Province of China.
- You are invited to participate because you have been diagnosed with hypertension three years ago and are taking anti-hypertensive medications.
- If you agree to participate, you will be asked to come to the clinic Monday morning at 9 o'clock. Do you have any questions?
- This will take about 45 minutes to an hour of your time.
- You will not be paid for your participation in this study.
- Possible risks are to your privacy, but I will try my best to keep your information as confidential. No data will be seen with your name on it directly. The identifying information will be kept separately from your data.
- Although you will not benefit directly from this study, we hope the results will help us learn how to management hypertension well.
- Do you have any questions?

- You can contact me at 139-581-31637.
- Participation is voluntary. Your decision whether or not to participate or to terminate at any time will not affect your care.
- Would you like to participate in this study?
- Thank you for your time.

APPENDIX E

COVER PAGE

You are invited to participate in this survey because you are an adult age 18 or older living in Yuzhao or Hengshan Village in Tonglu county, Zhejiang province and you have been diagnosed with hypertension. This research is being conducted by Yang Lili, a nurse, as part of her doctoral education. The purpose of this study is to examine factors influencing systolic blood pressure among the adults with hypertension in rural China.

Participation in this study involves answering questions about you such as your age, education level, yearly household income, living arrangement, your current medications, and other things you do to manage your hypertension. Questions about your knowledge of hypertension will also be asked. Blood pressure, weight, and height will be measured at the clinic. It will take approximately 45 minutes to an hour to complete the whole process. Whether or not you participate is your choice. If you agree to participate you may stop the interview at any time or choose to not answer some questions.

There is a minimal risk that your information may not be kept confidential; however, this possibility will be minimized by using a survey form that will not include your name or address or include any information that could be used to identify you. If you wish to proceed and participate after reading this letter you will complete the survey that is attached. If you do not read, one of us will read to you and fill the forms for you with your verbal answers. Your blood pressure will be measured twice to get the average value. When you have completed the survey you may place it in the envelope provided and hand it back to me. When the results are received by us, there will be no information linking your answers back to you.

Although you will not benefit directly from this study, the information provided will be used to develop good strategies to improve blood pressure management for you as well as for others with hypertension.

You may contact an impartial third party not associated with this study regarding any concerns or complaints you may have, by calling Dr. Ye Zhihong at 860-06608 (office) at Sir Run Run Shaw Hospital, School of Medicine, Zhejiang University for information and assistance.

Thank you for giving consideration to this invitation. If you have any questions, please ask me. By completing the attached survey you will be giving your consent to participate.

Sincerely,

Yang Lili, RN, MS, PhD Student

您好！

因为您是浙江省桐庐县余姚或衡山村 18 岁及以上被诊断为高血压的成年人，我们将邀请您加入《影响中国农村成人高血压患者收缩压相关因素的调查》。该研究是杨丽黎护理博士研究生学习课程中的一部分，该课题的目的是研究影响中国农村成人高血压患者收缩压的相关因素，为进一步指导生活方式提供依据。

该研究需要被研究者提供年龄、文化程度、家庭年收入、生活方式、目前所服用药物以及控制血压的其他行为方式等一般个人资料和疾病相关信息。另外，还将收集对高血压病的认识和感知方面的信息，我们还需要在诊所为被调查者测量血压（测量两次，取平均值作为研究数据）、身高和体重，整个过程将持续 45 分钟到 1 个小时。您可以自由选择是否参与该研究，且在参与过程中您有权随时退出或拒绝回答某些问题。

我们将对所有的信息进行保密，且问卷调查表不会包含您的姓名、地址及任何可以识别您的信息。如果您读完这封邀请信后决定继续参与该项研究，请完成调查问卷的填写。如果您不认字，我们可以读给您听并根据您的回答填写调查表。当您填完之后，请将调查表装入为您提供的信封里，我们收到后将不会就您的信息进行再次反馈。

尽管您不会从该研究中直接获利，但我们将会利用您所提供的信息为您及其他高血压患者制作出管理高血压的策略。

如果您有任何疑问或不满，可以联系与该研究无任何关系的第三方：浙江大学医学院附属邵逸夫医院叶志弘博士，办公室电话为 0571-86006608.

非常感谢您的关注，如果您有任何疑问都可以询问我。完成该调查表后，我们将认为您同意参加该研究项目。

杨丽黎

注册护士，研究生，在读博士

APPENDIX F

RESEARCH ASSISTANTS TRAINING COURSE

Description

This course is designed to train three RAs to recruitment procedures and conduct effective data collection procedure based on the understanding of study purpose and research design. Opportunities will be provided for them to return demonstrate the recruitment procedure and data collection, and BP, weight and height measurements after observing PI's demonstration.

Objectives

After 4 hours of training, three RAs will be able to:

1. Explain to the research participants the purpose of the study.
2. Explain the benefits and risks for participants in this study.
3. Demonstrate the verbal informed consent obtaining process, questionnaires administration, and BP, weight and height measurements.

Audience

Three research assistants who are the students of MSN in Zhejiang University and have earned the IRB certificate and received the Conflict of Interest training.

Date**:** Oct.29, 2014

Time: 1300-1700

Place: Third meeting room at Sir Run Run Shaw Hospital

Training schedule

Time	Topic	Trainer
1300-1330	Overview of the study Recruitment procedures and role of RA in the recruitment	Yang Lili
1330-1415	Demonstration and return demonstration of telephone call and explanation of the Consent Cover Letter	Yang Lili
1415-1515	Data collection procedure Demonstration and return demonstration	Yang Lili
1525-1555	BP measurement (timing, positioning, number of measures) Demonstration and return demonstration	Yang Lili
1555-1630	Height and weight measurements Demonstration and return demonstration	Yang Lili
1630-1700	Questions and conclusion Inform ongoing monitoring of all procedures	Yang Lili

Evaluation

1. Return demonstration of all procedures
2. Monitor whether RAs are maintaining fidelity of data collection protocol by student PI
3. Student PI continues to monitor RA data collection procedures by random observation and debriefing of RA during data collection phase of study

APPENDIX G

QUESTIONNAIRES

一般情况 DEMOGRAPHIC AND ILLNESS CHARACTERISTICS

编号 ID: _____

性别 Gender:

☐男 Male
☐女 Female

年龄 Age: _____

婚姻:

☐从未结过婚 Never married
☐已婚 Married
☐离异 Divorced
☐丧偶 Widowed

居住情况 Living arrangement:

☐独自居住 Live alone
☐与家人同住 Live with family in same house
☐与家人住得较近 Live near family

上次去社区卫生室的时间: 年 月 日 Last visit to clinic Date _____

工作情况 Employment status:

☐无 Not employed
☐是 Employed

工种 Type of work:

☐农活 Farm
☐办公室 Office
☐车间工作 Workshop
☐其它 Others

教育年份 Years of Education: _____

年收入 Annual household income: _____

高血压诊断后时长 Length of diagnosis: _____

抗高血压药名称 Names of Anti-hypertensive Drugs:

_____
_____
_____
_____

中草药 Herbal Drugs:

_____
_____
_____
_____

采用其它控制高血压的方法 Other ways to control blood pressure：

☐气功 Qi Kung 频率 Frequency _____次/天 Times/day
☐ 太极 Taiji 频率 Frequency _____ 次/天 Times/day
☐ 民间秘方 Folk's method 频率 Frequency _____次/天 Times/day
☐其它 Others

_____
_____
_____

身高（米）Height (M): _____

体重（公斤）Weight (Kg): _____

收缩压 (第一次) Systolic Blood Pressure (first) _____

（第二次 Systolic Blood Pressure(second) _____

舒张压 (第一次）Diastolic Blood Pressure (first) _____

（第二次）Diastolic Blood Pressure (Second) _____

ILLNESS PERCEPTION QUESTIONNAIRE (IPQ-R)

第一部份　疾病知觉量表

PART I Illness Representation

在这部分我们想了解的是您个人对高血压疾病的看法。不论医生、或家人怎么说，我们想知道是您自己的想法。以下问题请根据您所认为的同意程度，在空格内打勾 “∨”。

We are interested in your own personal views of how you now see your current illness. Please indicate how much you agree or disagree with the following statements about your illness by ticking the appropriate box.

	我认为 **VIEWS ABOUT YOUR ILLNESS**	非常不同意 STRONGLY DISAGREE	不同意 DISAGREE	没意见 NEITHER AGREE NOR DISAGREE	同意 AGREE	非常同意 STRONGLY AGREE
1	我的高血压会在短时间内痊愈。 My illness will last a short time					
2	我高血压的病是永久性而非短时间的。 My illness is likely to be permanent rather than temporary					
3	我的高血压会拖很长一段时间。 My illness will last for a long time					

4	我的高血压应该很快就会好了。 This illness will pass quickly					
5	我认为我这辈子都会有高血压。 I expect to have this illness for the rest of my life					
6	我高血压的病情严重。 My illness is a serious condition					
7	我的高血压对我的生活有严重影响。 My illness has major consequences on my life					
8	我的高血压严重影响别人对我的看法。 My illness strongly affects the way others see me					
9	我的高血压给我带来了沉重的经济负担。My illness has serious financial consequences					
10	我的高血压对我身边的人造成许多困难。My illness causes difficulties for those who are close to me					

11	应该有很多方法可以控制我的病症。 There is a lot which I can do to control my symptoms					
12	我个人所做的可以决定我的病情变好或变坏。What I do can determine whether my illness gets better or worse					
13	我的个人因素，可以改变患病的过程。 The course of my illness depends on me					
14	无论我怎么做，都无法影响我的高血压。 Nothing I do will affect my illness					
15	我有能力可以改变我的高血压。 I have the power to influence my illness					
16	我的照顾活动对我的病情后果是没有帮助。 My actions will have no effect on the outcome of my illness					

17	我的高血压会很难有所改变。 My illness is hard to improve					
18	要改善我的高血压，能做的实在有限。 There is very little that can be done to improve my illness					
19	目前的治疗会有效地治好我的高血压。 My treatment will be effective in curing my illness					
20	目前的治疗可以预防（避免）因高血压造成的不良影响。 The negative effects of my illness can be prevented (avoided) by my treatment					
21	目前的治疗可以控制我的高血压。 My treatment can control my illness					
22	没有什么办法可以改善我的高血压。 There is nothing which can help my condition					

23	我的很多病症让我感到不解。 The symptoms of my condition are puzzling to me					
24	我的高血压像个谜一样难以理解。 My illness is a mystery to me					
25	我不了解我的病。 I don’t understand my illness					
26	我的病对我来说不合情理，实在无法理解。 My illness doesn’t make any sense to me					
27	我对我的高血压和病情变化有一清楚了解。 I have a clear picture or understanding of my condition					
28	我高血压的症状每天变化很大。 The symptoms of my illness change a great deal from day to day					
29	我高血压的症状反复周期性地出现。 My symptoms come and go in					

	cycles					
30	我的高血压非常难以预料。 My illness is very unpredictable					
31	我经历多次高血压变好变坏的循环。 I go through cycles in which my illness gets better and worse.					
32	一想到我的高血压我就感到郁闷。 I get depressed when I think about my illness					
33	我的高血压令我感到生气。 My illness makes me feel angry					
34	得这个病让我觉得担心、忧虑。 Having this illness makes me feel anxious					
35	我的高血压让我感到害怕。 My illness makes me feel afraid					

第二部分 患病的原因

人们对为什么生病有不同的看法，我们想知道您的看法如何。以下问题没有一定的正确答案，不论医生、或您的家人怎么说，我们只想知道您自己的看法。请按您同意的程度，勾选出与您想法最接近的答案。

PART II CAUSES OF MY ILLNESS

We are interested in what you consider may have been the cause of your illness. As people are very different, there is no correct answer for this question. We are most interested in your own views about the factors that caused your illness rather than what others including doctors or family may have suggested to you. Below is a list of possible causes for your illness. Please indicate how much you agree or disagree that they were causes for you by ticking the appropriate box.

	我认为让我患病高血压的原因是… POSSIBLE CAUSES	非常不同意 STRONGLY DISAGREE	不同意 DISAGREE	没意见 NEITHER AGREE NOR DISAGREE	同意 AGREE	非常同意 STRONGLY AGREE
1	压力或烦恼 Stress or worry					
2	食物或饮食习惯 Diet or eating habits					
3	流年不利或犯冲 Bad year or disharmony					
4	以前缺乏医疗照顾 Poor medical care in my past					
5	我个人的生活型态(如：静态没运动的生活型态) My lifestyle					
6	我的心态问题(如：对人生悲观的想法) My mental attitude e.g. thinking about life negatively					
7	家庭（或人际）的问题或忧虑 Family problems or worries caused my illness					
8	工作过度劳累 Overwork					
9	我的情绪状态（如感觉沮丧、寂寞、焦虑或空虚） My emotional state e.g. feeling down, lonely, anxious, empty					
10	喝酒 Alcohol					
11	抽烟 Smoking					
12	与个人八字有关 My fate					
13	与自己个性有关 My personality					
14	因免疫力不如从前					

	Altered immunity					
15	运气不好或碰巧发生 Chance or bad luck					
16	睡眠不好 Poor sleeping pattern					
17	体内燥热或气血循环差 Dry and warm inside body or poor gas and blood circulation					
18	天气变化 Change of the weather					

在以下空格中，请一次填入三个您认为最可能导致您生病的原因，或是填入其他您认为最可能的因素。

第一 _____;第二 _____第三

In the table below, please list in rank-order the three most important factors that you now believe caused YOUR illness. You may use any of the items from the box above, or you may have additional ideas of your own.

The most important causes for me:

1. _____
2. _____
3. _____

第三部分　高血压症状经验量表

以下是一般患病过程中，可能出现的症状，有的症状您可能经历过，有些或许从来没有经历过。为了增进我们的了解，请根据下列问题，圈选出您曾经历的症状经验。第一栏请勾选您是否有过以下症状；第二栏，请勾选您认为的症状发生是否与高血压有关。

YOUR VIEWS ABOUT YOUR ILLNESS

Listed below are a number of symptoms that you may or may not have experienced since your illness. Please indicate by circling Yes or No, whether you have experienced any of these symptoms since your illness, and whether you believe that these symptoms are related to your illness.

症状项目 Symptoms	发生情况 I have experienced this symptom since my illness 有 没有 Yes No	症状可能原因与高血压 This symptom is related to my illness Yes No
1 胸口闷闷的 Breathlessness	☐ ☐	☐ ☐
2 恶心呕吐 Nausea	☐ ☐	☐ ☐
3 呼吸会喘 wheeziness	☐ ☐	☐ ☐
4 记忆变差 Diminished memory	☐ ☐	☐ ☐
5 关节僵硬或肿胀 Stiff Joints	☐ ☐	☐ ☐
6 脖子酸僵或紧绷 Stiff neck	☐ ☐	☐ ☐
7 身体热热的 Feeling flushed	☐ ☐	☐ ☐
8 眼睛雾 Sore Eyes	☐ ☐	☐ ☐
9 头重重脚浮浮 Fatigue	☐ ☐	☐ ☐
10 头痛 Headaches	☐ ☐	☐ ☐
11 下肢肿胀 Swelling legs	☐ ☐	☐ ☐
12 排尿次数增加 Increased frequency of urination	☐ ☐	☐ ☐
13 口干舌燥 Mouth dryness	☐ ☐	☐ ☐
14 排尿困难 Dysuria	☐ ☐	☐ ☐
15 全身无力 Loss of Strength	☐ ☐	☐ ☐
16 性欲减低 Loss of Libido	☐ ☐	☐ ☐
17 睡眠问题 Sleep Difficulties	☐ ☐	☐ ☐
18 头晕 Dizziness	☐ ☐	☐ ☐
19 阳痿或性冷淡 Impotence	☐ ☐	☐ ☐
20 感觉热或潮红 Feeling Flushed	☐ ☐	☐ ☐
21 心脏砰砰跳 Fast Heart Rate	☐ ☐	☐ ☐
22 身体某部分麻木或刺痛 Pins and Needles	☐ ☐	☐ ☐

23 手脚冰冷会冒汗 Cold hands and feet	☐ ☐	☐ ☐
24 手会发抖 Hands trembling	☐ ☐	☐ ☐
25 肌肉不由自主紧绷发抖 Muscle tension and trembling	☐ ☐	☐ ☐
26 咳嗽 Cough	☐ ☐	☐ ☐
27 便秘 Constipation	☐ ☐	☐ ☐
28 视力模糊不清 Blurred vision	☐ ☐	☐ ☐
29 胃部不适 Upset Stomach	☐ ☐	☐ ☐
30 皮肤痒或疹子 skin itch or rashes		

第四部分 高血压药物依从性量表

PART IV MEDICATION ADHERENCE INVENTORY

【填表说明】：下列题目主要是想了解您从今天起过去一个月内自己高血压照顾方法，每一题有五个答案，分别代表**该题目执行的频率，**请按目前实际情况，勾选最相近答案。

Description: We intend to know how you take care of your hypertension in the last month dated back from today. Please indicate by circling how often you do.

1 代表「从来没有」，指过去一个月中每星期都没有如此做
Never: never during the weeks in the past month

2 代表「偶尔这样」，指过去一个月中每星期会有 1—2 天如此做
Occasionally: 1-2 days each week in the past month

3 代表「有时这样」，指过去一个月中每星期会有 3 天如此做
Sometimes: 3 days each week in the past month

4 代表「常常这样」，指过去一个月中每星期会有 4-5 天如此做
Often: 4-5 days each week in the past month

5 代表「几乎都这样」，指过去一个月中每星期会几乎每天如此做
Almost every day: Almost every day in the past month

		Never 从来没有	Occasionally 偶尔这样	Sometimes 有时这样	Often 常常这样	Almost every day 几乎每天
药物治疗 Drug Therapy						
1.	一般人常会忘记服药您也有此经验吗？ Do you often forget taking your medications like some others?					
2.	您会因为某些原因而更改服药时间吗？ Do you change medication time due to some reasons?					
3.	您会因为某些原因而自行停止部分药物吗？ Do you take only part of prescribed medications for some reasons?					
4.	您会因某些原因而自行停止服用全部药物吗？ Do you stop taking all medications for some reasons?					
5.	您会因为某些原因而断断续续服药吗？ Do you taking medications intermittently for some					

	reasons?					
6.	您会因为某些原因自行增加服药次数吗？ Do you increase the frequency of medication use due to some reasons?					
7.	您会因为某些原因自行减少服药次数吗？ Do you decrease the frequency of medication use due to some reasons?					
8.	您会因为某些原因自行增加服药种类吗？ Do you increase the types of medications due to some reasons?					
9.	您会因为某些原因自行减少服药种类吗？ Do you decrease the types of medications for some reasons?					
10	您会因为某些原因自行增加服药剂量吗？ Do you increase the dosage of prescribed medication for some reasons?					
11	您会因为某些原因自行减少服药剂量吗？ Do you decrease the dosage of prescribed medication for some reasons?					
12	您每一次拿回去的药物全部都吃完的频率？ How often do you take all medications per each prescription?					
13	您会在假日或连续放假时忘了服药的频率？ How often do you forget taking medications during the holidays or days off?					

第五部分 高血压药物依从性量表

PART V INVENTORY OF ADHERENCE TO SELF-MANAGEMENT

【填表说明】：下列题目主要是想了解您从今天起过去一个月内自己高血压照顾方法，每一题有五个答案，分别代表**该题目执行的频率，**请按目前实际情况，勾选最相近答案。

Description: We intend to know how you take care of your hypertension in the last month dated back from today. Please indicate by circling how often you do.

1 代表「从来没有」，指过去两周都没有如此做

Never: never during the past two weeks

2 代表「偶尔这样」，指过去两周内每星期会有 1—2 天如此做

Occasionally: 1-2 days each week in the past two weeks

3 代表「有时这样」，指过去两周每星期会有 3 天如此做

Sometimes: 3 days each week in the past two weeks

4 代表「常常这样」，指过去两周每星期会有 4-5 天如此做

Often: 4-5 days each week in the past two weeks

5 代表「几乎都这样」，指过去两周每星期会几乎每天如此做

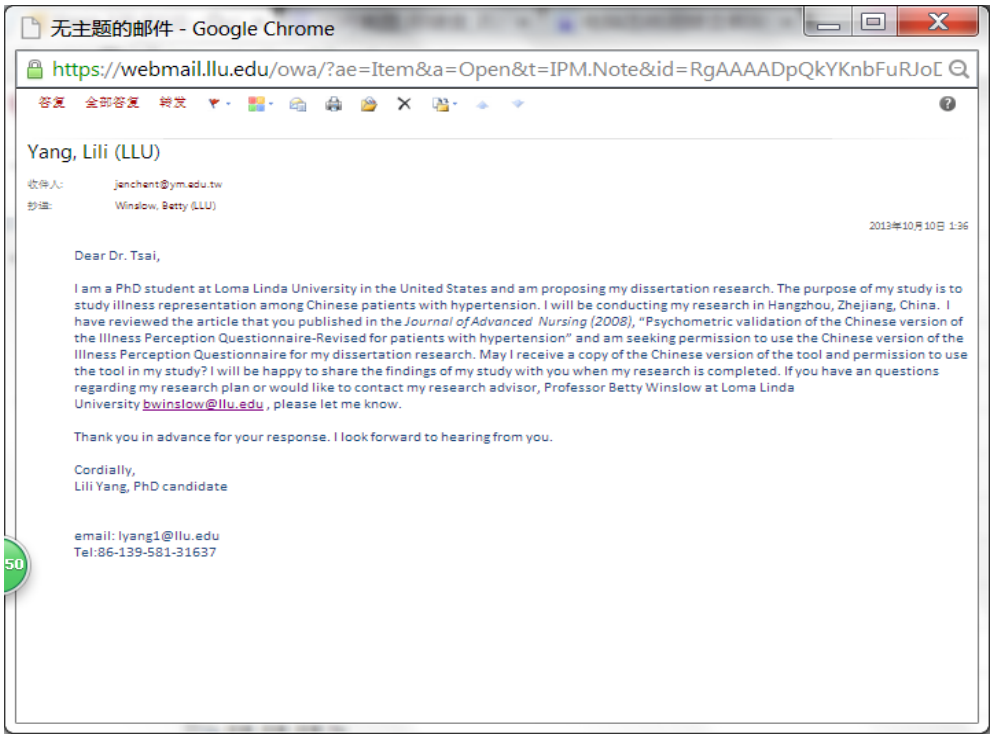
Almost every day: Almost every day in the past two weeks

自我照顾 Self-management						
		Never 从来没有	Occasionally 偶尔这样	Sometimes 有时这样	Often 常常这样	Almost every day 几乎每天
1	您用餐时选择新鲜、不含人工添加物食物的频率？ How often do you select fresh, none artificial seasoned food?					
2	您为控制高血压改变自己饮食习惯的频率？ How often do you change your diet habit for your blood pressure control?					
3	您用餐时选择香肠、腌肉、豆腐乳、罐头、泡菜等腌制品食物频率？ How often do you choose sausage, preserved meats, preserved Toufu, canned food, pickles for your meals?					
4	您购买食品时，注意含盐份标示的频率？ How often do you read the food					

	labeling for salt when you purchase the food?					
5	您用餐时额外加盐、酱油、豆瓣酱或辣椒酱等调料的频率？ How often do you use extra salt, seasonings such as soy sauce, bean sauce or peppy sauce?					
6	您用餐时食用肥肉、蹄髈等食物的频率？ How often do you eat fatty meats, pig's paws?					
7	您在用餐时会食用动物内脏、脑、肝和海产食物如虾、鱿鱼等食物吗？ Do you eat animal guts, brain, liver and seafood such as shrimps, squid?					
8	您用餐时食用油炸、油煎或奶油调制食物的频率？ How often do you eat fried food or creamy food?					
9	您在决定用餐型态时，考虑对体重影响的频率？ How often do you consider that your diet habit might influence your weight control?					
10	您规律做运动的频率？ How often do you exercise on regular-base?					
11	您每周运动 3-4 次，每次 20-30 分钟的频率？ How often do you exercise 3-4 times per week and 20-30 minutes each time?					

APPENDIX H

PERMISSION TO USE THE CIPQ-R



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答复 全部答复 转发

Yang, Lili (LLU)

收件人: jenchent@ym.edu.tw

抄送: Winslow, Betty (LLU)

2013年10月10日 1:36

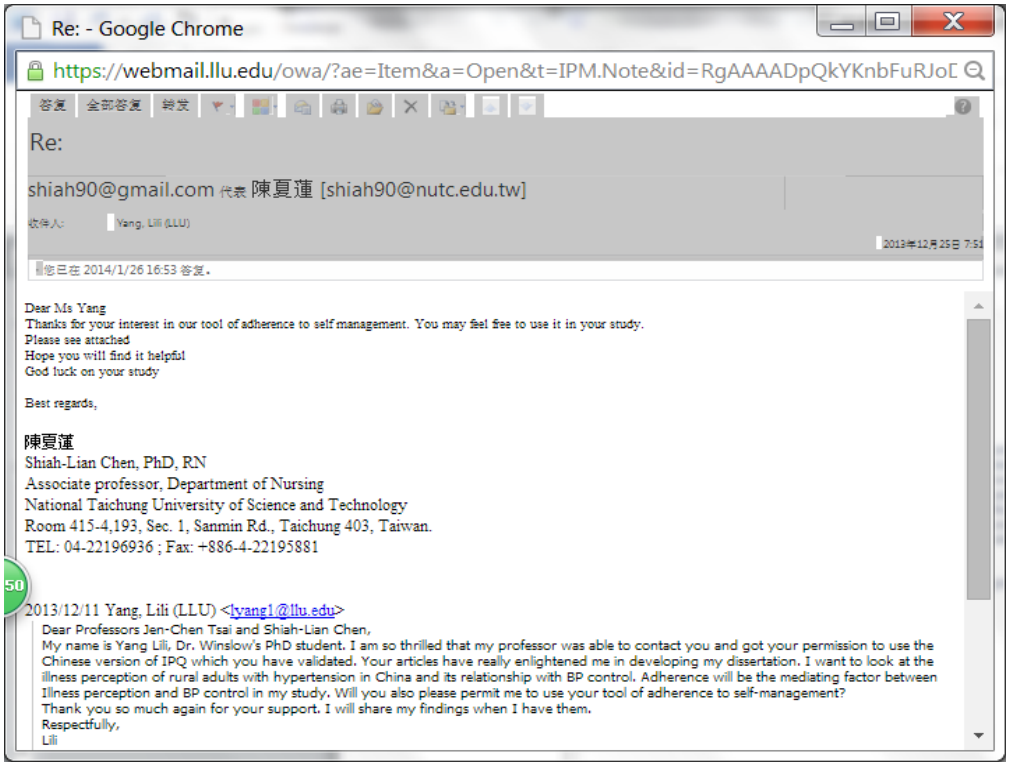
Dear Dr. Tsai,

I am a PhD student at Loma Linda University in the United States and am proposing my dissertation research. The purpose of my study is to study illness representation among Chinese patients with hypertension. I will be conducting my research in Hangzhou, Zhejiang, China. I have reviewed the article that you published in the *Journal of Advanced Nursing (2008)*, "Psychometric validation of the Chinese version of the Illness Perception Questionnaire-Revised for patients with hypertension" and am seeking permission to use the Chinese version of the Illness Perception Questionnaire for my dissertation research. May I receive a copy of the Chinese version of the tool and permission to use the tool in my study? I will be happy to share the findings of my study with you when my research is completed. If you have an questions regarding my research plan or would like to contact my research advisor, Professor Betty Winslow at Loma Linda University bwinslow@llu.edu , please let me know.

Thank you in advance for your response. I look forward to hearing from you.

Cordially,
Lili Yang, PhD candidate

email: lyang1@llu.edu
Tel:86-139-581-31637



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答复 全部答复 转发

Re:

shiah90@gmail.com 代表 陳夏蓮 [shiah90@nutc.edu.tw]

收件人: Yang, Lili (LLU)

2013年12月25日 7:51

他已在 2014/1/26 16:53 答复。

Dear Ms Yang
Thanks for your interest in our tool of adherence to self management. You may feel free to use it in your study.
Please see attached
Hope you will find it helpful
God luck on your study

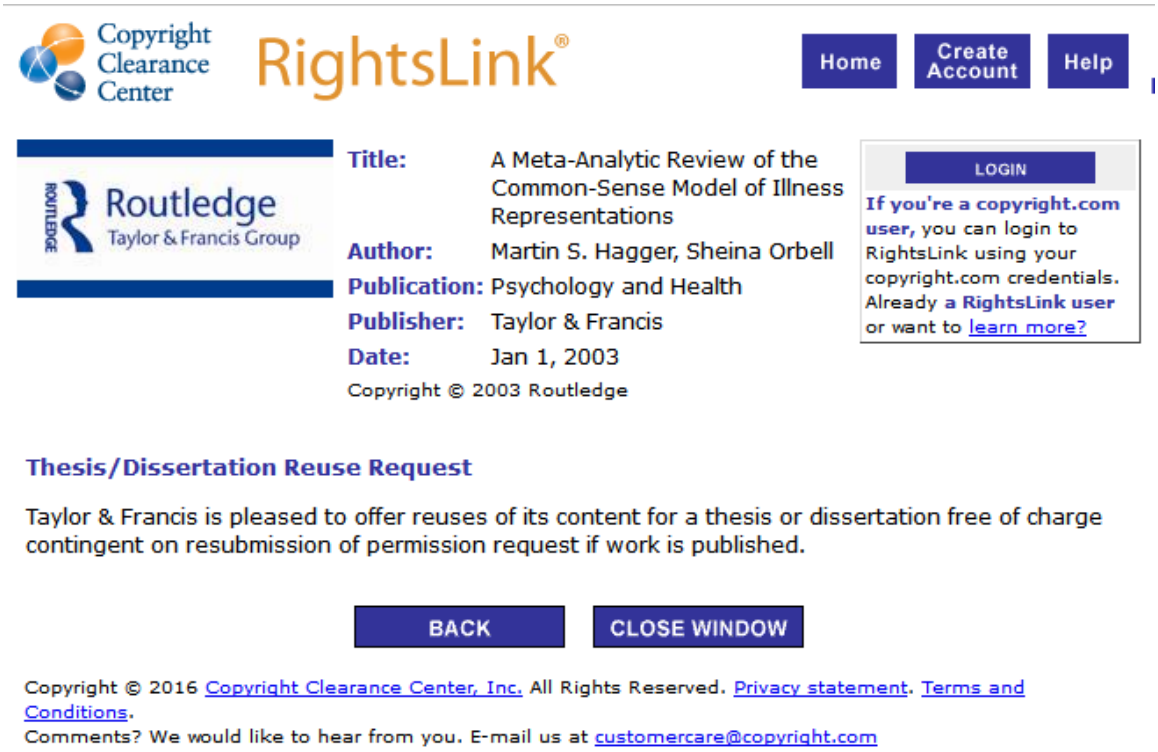
Best regards,

陳夏蓮
Shiah-Lian Chen, PhD, RN
Associate professor, Department of Nursing
National Taichung University of Science and Technology
Room 415-4,193, Sec. 1, Sanmin Rd., Taichung 403, Taiwan.
TEL: 04-22196936 ; Fax: +886-4-22195881

2013/12/11 Yang, Lili (LLU) <lyang1@llu.edu>
Dear Professors Jen-Chen Tsai and Shiah-Lian Chen,
My name is Yang Lili, Dr. Winslow's PhD student. I am so thrilled that my professor was able to contact you and got your permission to use the Chinese version of IPQ which you have validated. Your articles have really enlightened me in developing my dissertation. I want to look at the illness perception of rural adults with hypertension in China and its relationship with BP control. Adherence will be the mediating factor between Illness perception and BP control in my study. Will you also please permit me to use your tool of adherence to self-management?
Thank you so much again for your support. I will share my findings when I have them.
Respectfully,
Lili

APPENDIX I

PERMISSION TO ADAPT THE MODEL



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Routledge Taylor & Francis Group

Title: A Meta-Analytic Review of the Common-Sense Model of Illness Representations

Author: Martin S. Hagger, Sheina Orbell

Publication: Psychology and Health

Publisher: Taylor & Francis

Date: Jan 1, 2003

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APPENDIX J

PERMISSION TO ADAPT THE MODEL FROM THE AUTHOR

This is absolutely fine with me, please go ahead and reproduce. I wish you and Yang Lili the best of luck going forward. If any publication arise from the thesis, I would be interested in reading them.

Best wishes,
Martin

Martin S. Hagger
John Curtin Distinguished Professor
Director of Health Psychology & Behavioural Medicine Research Group
Editor, *Health Psychology Review*
Co-Editor, *Stress and Health*
School of Psychology and Speech Pathology
Faculty of Health Sciences
Curtin University
Tel | +61 (0)8 9266 2215
Fax | +61 (0)8 9266 2464
Mobile | +61 (0)411058687

Dear Professor Hagger:

We have been attempting to follow the protocol to receive permission for our PhD student to include in her dissertation an adaptation of a figure that you have published (Hagger, M., & Orbell, S. (2003). A meta-analytic review of the common-sense model of illness representations. *Psychology & Health*, *18*(2), 141-184.). We received notification from the publisher, that their permissions are granted for exact replication of the figure and they have indicated that we should request permission from you. Please see our original request to the publisher and their responses below. Based on the advice of the publisher we are asking your permission for my PhD candidate, Yang Lili, to include her adaptation (see below) of your figure as cited below in her dissertation. Since she is submitting her dissertation in a few days, we are hoping for a timely response.

Thank you in advance for your response to this request.

Cordially,
Betty

Betty Winslow, PhD., RN - *Professor*
LOMA LINDA UNIVERSITY | School of Nursing