

EXERCISE PARTICIPATION: SLEEP QUALITY IN THAI OLDER ADULTS

A Dissertation

Presented to

The Faculty of the Graduate School

At the University of Missouri-Columbia

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

By

CHANTRA PROMNOI

Dr. Lorraine J. Phillips, Dissertation Supervisor

DATE

December 2016

The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

EXERCISE PARTICIPATION: SLEEP QUALITY IN THAI OLDER ADULTS

presented by Chantra Promnoi,

a candidate for the degree of Doctor of Philosophy,

and hereby certify that, in their opinion, it is worthy of acceptance.

Associate Professor Lorraine J. Phillips

Associate Professor Deidre D. Wipke-Tevis

Associate Professor Emeritus Myra Aud

Associate Professor Christine Proulx

DEDICATION

This dissertation is dedicated to my parents, Mr. Sanan and Ms. Sakorn Promnoi, for their immeasurable support and for teaching me to work hard for the things that I desire to achieve. Without both of you, this endeavor would not be possible. I am truly thankful for having you in my life.

ACKNOWLEDGEMENTS

The accomplishment of this dissertation would have not been possible without guidance and support from a number of individuals. I would like to take this opportunity to recognize and express my gratitude to those who kindly helped and contributed throughout the process of dissertation research and my doctoral study.

First, I would like to thank Associate Professor Dr. Lorraine J. Phillips, my wonderful academic and dissertation advisor for extensive support and excellent guidance I have received during the entire course of my doctoral study. With the warmth and insightful encouragement from my advisor who believes in me and pushes me past limits, the success of my dissertation is possible. What I have learned from my advisor not only serves my academic success but also teaches me to grow as a nursing scholar and a moral person.

My deepest gratitude is also extended to my dissertation committee members, Associate Professor Dr. Deidre D. Wipke-Tevis, Associate Professor Dr. Myra A. Aud, and Associate Professor Dr. Christine Proulx, for their contributions to the development and completion of my research project. Their kindness and thoughtful suggestions have been invaluable to me during the process of conducting my dissertation research. I would also like to acknowledge Dr. Emily Leary, an assistant research professor of biostatistics in the Department of Health Management and Informatics, for her valuable advice during the data analysis. My special thank you goes to Dr. Luppana Kitrungrrote, Assistant Professor from the Faculty of Nursing, Prince of Songkla University, Thailand, for her help in the backward translation of the Geriatric Pain Scale that was used in my research project.

For my study at the Sinclair School of Nursing at the University of Missouri, I would like to acknowledge the support I received from the Faculty of Nursing Prince of Songkla University through “*the Thailand Development Scholarship Award (2012 – 2016)*” and the Sinclair School of Nursing, through “*the Fund the Drive for Nurses Scholarship (2016)*”. It is my hope that experiences and knowledge I have gained at the Sinclair School of Nursing can be of value to help improve nursing education in Thailand.

Aside from this, I am very pleased to thank my Thai sisters and brothers from the Thai Student Association and my international friends, for the friendships and fun times that make my life at MU more meaningful. Specifically, my special appreciation also goes to Warapark Maitreephun (Nong Ohm), a doctoral student in the College of Education, for all the time he has spent supporting and encouraging me to not give up during the tough times of my dissertation process.

Lastly, my research project could not have been completed without the tremendous help I received from the directors and staff at the senior clubs and district health promotion hospitals where I conducted the research study in Songkhla Province, Thailand. I would like to acknowledge all older adults who participated in the study. I am deeply appreciative for their assistance.

TABLE OF CONTENTS

| | |
|---|------|
| ACKNOWLEDGEMENTS..... | ii |
| LIST OF ILLUSTRATIONS..... | vii |
| LIST OF TABLES..... | viii |
| LIST OF ABBREVIATIONS..... | ix |
| ABSTRACT | x |
| Chapter One: Introduction..... | 1 |
| Introduction | 1 |
| Background | 2 |
| Significance of the Study | 6 |
| Specific Aims/Research Questions | 7 |
| Hypotheses | 8 |
| Definition of Terms | 9 |
| Conclusion | 12 |
| References | 13 |
| Chapter Two: Review of the Literature | 22 |
| Theoretical Framework | 22 |
| The Sleep-Wake Cycle and the Disturbances in the Normal Sleep Cycle with Aging | 26 |
| Sleep Disturbances as a Symptom Experience..... | 34 |
| Sleep Management Strategies | 37 |
| Factors that Influence Symptom Experience or Management Strategies | 48 |
| Conclusion | 56 |

| | |
|---|-----|
| Author’s Pilot Study on Sleep Disturbances in Thai Older Adults | 57 |
| References | 61 |
| Chapter Three: Methods | 88 |
| Research Design | 88 |
| Sample and Sample Size | 89 |
| Setting | 90 |
| Recruitment and Screening | 91 |
| Inclusion Criteria | 92 |
| Exclusion Criteria..... | 93 |
| Data Collection | 94 |
| Instruments | 96 |
| Human Subjects’ Protection | 101 |
| Data Management and Analysis | 105 |
| References | 112 |
| Chapter Four: Results | 117 |
| Demographic Characteristics of the Sample | 117 |
| Psychometric Analysis of Study Variables | 118 |
| Analyzed Results According to Research Questions | 121 |
| References | 134 |
| Chapter Five: Discussion/Conclusions..... | 135 |
| Symptom Management Model and Sleep Quality | 135 |
| Sleep Quality, Exercise Habits, and Sleep Quality..... | 136 |
| Factor Related to Sleep Quality..... | 138 |

| | |
|--|-----|
| Differences among Groups Relative to Study Variables | 142 |
| Strengths and Limitations | 149 |
| Implications and Future Research | 151 |
| Conclusions | 154 |
| References | 155 |
| REFERENCES | 166 |
| APPENDIX A: Institutional Review Board (IRB) | 206 |
| APPENDIX B: Introduction Letter | 207 |
| APPENDIX C: Flyers and Advertisements | 209 |
| APPENDIX D: Invitation and Consent Form | 213 |
| APPENDIX E: Research Questionnaires | 217 |
| APPENDIX F: Permission Letter | 243 |
| VITA | 247 |

LIST OF Illustrations

| Figure | Page |
|--|------|
| 2.1 The SMM Adopted for the Current Study..... | 23 |
| 2.2 The Normal Sleep Cycle and Physiological Changes in Each Sleep Stage... | 30 |
| 2.3 Changes in the Normal Sleep Cycle from Young Adults to Older Adults..... | 31 |

LIST OF TABLES

| Table | Page |
|--|------|
| 2.1 Psychometric Characteristics of Study Instruments | 58 |
| 3.1 Average Number of Exercise Attendees, Types and Frequency of Exercise Programs for Each Elder Club..... | 91 |
| 3.2 Summary of Data Collection Measures..... | 95 |
| 4.1 Demographic Characteristics of the Sample | 119 |
| 4.2 Exercise Characteristics for Participants at Elder Clubs..... | 119 |
| 4.3 Psychometric Properties of Study Variables | 120 |
| 4.4 Group Differences for Categorical Variables | 124 |
| 4.5 Group Differences for Continuous Variables | 125 |
| 4.6 Spearman's Rho and Point Biserial Correlation Coefficients among Study Variables..... | 128 |
| 4.7 Logistic Regression Analyses Predicting Poor Sleep Quality | 132 |
| 4.8 Characteristics of Continuous Variables for Participants with Insomnia and without Insomnia..... | 133 |

ABBREVIATIONS

| | |
|---------------|---|
| GDS-15 | 15-Item Geriatric Depression Scale |
| GPM-12 | Geriatric Pain Measure Short-Form |
| PSQI | Pittsburgh Sleep Quality Index |
| ISI | Insomnia Severity Scale |
| MET | Metabolic Equivalent of Task |
| SPAQ | Self-Reported Physical Activity Questionnaire |

ABSTRACT

Physical activity and social interaction may be related to sleep quality in older adults. This study aimed to explore differences in sleep quality among older adults who performed exercise at elder clubs, older adults who exercised at home, and older adults who did not exercise, as well as identify factors associated with sleep quality in this population. The Symptom Management Model was adopted to guide this study. Using a cross-sectional correlational design, three groups of participants (60 persons per group) who met inclusion criteria were recruited from senior clubs and communities from Hat Yai District, Songkha Province, Thailand. The Kruskal-Wallis test was used to analyze the differences in sleep quality as measured by the Pittsburg Sleep Quality Index and the Insomnia Severity Index among three groups. Logistic regression was used to estimate the extent to which health conditions, pain, depressive symptoms, social connectedness (social network and social support), and self-reported physical activity predicted sleep quality. No significant differences in sleep quality scores were found among the three groups, although the non-exercise group reported scores indicating poorer sleep quality, compared to the other two groups. Sleep quality was associated with number of health conditions, pain level, depressive symptoms, social connectedness (social network), and physical activity. The results of the logistic regression analysis showed that pain and depressive symptoms were significant predictors of sleep quality when controlling for age, gender, education, and marital status. The findings suggest that exercising can positively influence sleep. Healthcare providers should evaluate sleep quality in older adults within the context of their physical and mental health, as well as their social connections.

Chapter One

Introduction

Introduction

The growing aging population has become a global concern, including in Thailand. The World Health Organization (World Health Organization, 2015) reports that 12 % (900 million) of the world's population is age 60 or older, and this proportion of the population is expected to increase to 2 billion people by 2050. According to the census of the Thai population in 2016, the estimated number of older adults stands at 10 million (16% of the population), and if the current trends continue, this age group will exceed the number of children under 15 years of age within the next several years (Mahidol, 2016). More importantly, the proportion of Thai aging population is projected to reach 30% in 2040 (The Nation Economic and the Social Development Board, 2015).

Aging is associated with changes in all physiological processes that occur across the lifespan (World Health Organization, 2015). These changes can increase the risk of health conditions and affect individual's physical function. One important bodily function affected by aging is sleep, which is fundamental to the overall health and well-being of a person (Scullin, 2015). Changes in sleep patterns that interfere with sleep quality increase with age (Ancoli-Israel, 2009). These changes include increased time spent falling asleep (sleep onset latency), increased nighttime awakenings, decreased total sleep time (sleep duration), and loss of sleep efficiency (percentage of time spent sleeping) (Alessi & Vitiello, 2011; Ohayon, Carskadon, Guilleminault, & Vitiello, 2004). Older adults most often complain of poor nighttime sleep and subsequently impaired daytime functioning (Rodriguez, Dzierzewski, & Alessi, 2015). As poor nighttime sleep causes feelings of

fatigue, it impacts physical, social, and psychological functioning in older adults (Deratnay & Sidani, 2013).

Background

Numerous research studies indicated that sleep problems or sleep disturbances are common in older adults (Foley, Ancoli-Israel, Britz, & Walsh, 2004; Ohayon & Partinen, 2002; Rashid, Ong, & Eleanor Shu Yi, 2012; Rodriguez et al., 2015; Sukying, Bhokakul, & Udomsubpayakul, 2003). A survey of the National Sleep Foundation showed that nearly 50% of American older adults suffer from sleep problems (Foley et al., 2004). This number is congruent with the prevalence of sleep complaints in Asian countries, such as Taiwan and China, which ranged from 40% to 60% (Wu, Su, Fang, & Yeh Chang, 2012; Yang & Chiou, 2012). Sleep problems found in older adults include insomnia, periodic limb movements in sleep, obstructive sleep apnea, and restless legs syndrome (Crowley, 2011). Among these conditions, insomnia is the most common type of sleep problems found in older adults (Ancoli-Israel, 2009; Ohayon & Partinen, 2002). An epidemiological survey of over 40,000 Thai elders revealed a 46.7% prevalence of insomnia (Sukying et al., 2003). Of those respondents with insomnia, 33% experienced wakening earlier in the morning, 32.4% experienced frequent nighttime awakening, and 30.3% experienced difficulty falling asleep.

Multiple factors contribute to elders' sleep problems. Several studies noted that the probability of having sleep problems was related to physical health status (Mazzotti, Guindalini, Sosa, Ferri, & Tufik, 2012; Peltzer, 2012). Researchers also emphasized the higher prevalence of poor sleep found in older adults with high number of comorbidities, more severe and multisite pain, and poor perceived health status (Ancoli-Israel, 2009;

Blågestad et al., 2012; Foley et al., 2004). McHugh, Casey, and Lawlor (2011) conducted a longitudinal study and found that feeling lonely can predict poor sleep quality at a two-year follow-up. Likewise, older adults with higher depressive symptoms tend to report poorer sleep quality scores (Su, Huang, & Chou, 2004). Not only do these factors alter sleep quality, but also sedentary lifestyles and socio-demographic factors, such as female gender, low educational level, and not currently married, show a positive relationship with poor sleep complaints (Mazzotti et al., 2012; Ogunbode, Adebusoye, Olowookere, Owolabi, & Ogunniyi, 2014; Peltzer, 2012; Yang & Chiou, 2012).

The impact of poor sleep quality in older adults is substantial. Some studies showed that poor sleep quality lowered physical function and increased risk of diabetes mellitus and heart disease (Gottlieb et al., 2005; Spira et al., 2012; Suzuki et al., 2009). Other studies revealed, older adults with poor nighttime sleep were three to four times more likely to suffer multiple falls than those with better sleep (Hill, Cumming, Lewis, Carrington, & Le Couteur, 2007; St George, Delbaere, Williams, & Lord, 2009). Not only does poor sleep quality negatively impact physical health, but it also impairs cognitive functions (Jirong, Changquan, Hongmei, & Bi-Rong, 2013; Sexton, Storsve, Walhovd, Johansen-Berg, & Fjell, 2014). Besides these studies, poor sleep was also found to accelerate the onset of depressive symptoms and anxiety (Jackson, Sztendur, Diamond, Byles, & Bruck, 2014). Additionally, older adults whose sleep duration was less than seven hours per night had a 16% higher risk of mortality compared to older adults whose sleep duration was longer than seven hours (Xiao, Keadle, Hollenbeck, & Matthews, 2014). Overall, helping older adults attain better sleep would benefit all-cause mortality and quality of life.

Physical activity has been recommended as an alternative and complementary approach to promote sleep. Numerous research studies have illustrated that exercising can improve sleep onset latency, sleep duration, sleep efficiency, and nighttime awakenings; in addition, it can lead to the decreased use of sleep medications (Montgomery & Dennis, 2002; Reid et al., 2010; Roveda et al., 2011; Sherrill, Kotchou, & Quan, 1998; Shizheng et al., 2015). Experts posit that physical activity improves sleep through the mechanism of body homeostatic regulation and neurological stimuli that affect sleep-wake cycles and emotional status (Manzar, Sethi, & Hussain, 2012; Uchida et al., 2012). Mind-body exercises, such as Tai Chi and yoga, and non-mind-body exercises, such as endurance, walking, stretching, and resistance exercise, show significant benefits for sleep quality and are safe for older adults to practice independently at home (Buman, Hekler, King, & Bliwise, 2011; King et al., 2008; Kredlow, Capozzoli, Hearon, Calkins, & Otto, 2015; Shizheng et al., 2015)

Although increasing physical activity in older adults is essential for good health, less than half of older adults (40%) worldwide engaged in regular physical activity (Belza & the Prevention Research Centers-Healthy Aging Research Network Physical Activity Conference Planning Workgroup, 2007). In Thailand, up to 60% of older adults routinely engaged in physical exercise, but only 20% met the national health policy goal of physical activity recommendation (Kraithaworn, Sirapo-ngam, Piaseu, Nityasuddhi, & Gretebeck, 2011). In recognition of older adults' generally low activity levels, in 2005 the Thai government established the Healthy Thailand Project and created clubs in all sub-districts to provide exercise programs and health promotion instruction (Jitapunkul & Wivatvanit, 2009). The importance of this was seen in a study that revealed that being

elder club members can significantly predict an increase in physical activity among older adults (Poolsawat, 2007).

In addition to physical activity influencing sleep, some changes in the Thai social context may create additional factors related to poor sleep quality. These changes include a smaller family size, migration of young adults from rural areas to cities for work, and changes in living arrangement from living with children to living alone, all of which can affect social connectedness (Krishnakumar, Narine, Soonthorndhada, & Thianlai, 2015). Thanakwang (2008) highlighted the benefit of social connectedness or social connection as an aspect of kinship support that influenced an elderly person's sense of well-being and a friendship network significantly encouraged health-promotion behaviors. Social connectedness also benefits elder's physical and psychological well-being, healthy behaviors, and life satisfaction and can be enhanced by elder club participation (Cornwell & Laumann, 2015; Nyqvist, Forsman, Giuntoli, & Cattan, 2013; Thanakwang, 2008; Thanakwang & Soonthorndhada, 2011). Since strong social connectedness helps people stay active and promotes mental well-being, it may help older adults maintain good sleep. Although the positive outcomes of social connectedness have been described, information on the association between social connectedness and sleep quality is limited.

A better understanding of the relationship between physical activity gained through the participation in elder clubs and sleep quality and the role that social connectedness has on sleep quality for older adults is needed to inform gerontological nursing practice in Thailand. This study seeks to determine whether sleep quality for older adults who perform exercise at elder clubs differs from older adults who exercise at home and those who do not regularly exercise, and whether social connectedness

influences sleep quality in Thai older population. The study's findings will inform nursing knowledge about the potential benefits of exercise participation and social connectedness for sleep quality in older adults.

Significance of the Study

This study will provide knowledge to benefit older adults, healthcare providers, and the Thai healthcare system regarding the role of physical activity and social connectedness on sleep quality. In particular, understanding the relationship between elder club exercise participation and sleep quality could inform healthcare for older adults in Thailand and guide future nursing practice that aims to support the importance of community exercise programs for sleep promotion. In addition, the study's results will offer additional insights on the extent to which social connectedness is associated with better sleep quality and if differences exist for seniors who participate in elder club exercise programs compared to seniors who engage in home exercise programs and seniors who do not exercise regularly. This knowledge can be used as guidance for developing programs to promote sleep in older populations through the enhancement of social connectedness.

Elder clubs are places where older adults join activities together. Therefore, those people can keep in frequent contact with each other and have more group interaction than those who exercise at home. There is evidence that social connectedness in older adults can be promoted by facilitating individuals' connections through participation in leisure activities, such as engagement in exercise, sports, or religious activities (Toepoel, 2013). Activities arranged within elder clubs involve social interaction. Therefore, older adults who participate in elder club exercise programs may benefit from increased physical

activity levels and greater connection compared to older adults who do not attend elder clubs. Strong social connectedness is important for elder's physical and psychological well-being, happiness, and life satisfaction (Cornwell & Laumann, 2015). Thus, staying in contact with friends through elder club activities may influence good sleep quality by preventing the feelings of loneliness or isolation and reducing depressive symptoms, all of which are potential precipitating factors of sleep problems in older adults.

Specific Aims/Research Questions

Four specific aims for the proposed study are as follows:

1. Examine the differences in demographic variables (age, gender, educational level, marital status, and living status), health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity among Thai older adults who participate in an elder club exercise program compared to older adults who perform an exercise program at home and older adults who do not regularly exercise.

Research question one: Are there differences in demographic variables, health conditions, pain, depressive symptoms, social connectedness, and physical activity among older adults who participate in an elder club exercise program, older adults who perform an exercise program at home, and older adults who do not regularly exercise?

2. Examine the differences in sleep quality among Thai older adults who participate in an elder club exercise program compared to older adults who perform an exercise program at home and older adults who do not regularly exercise.

Research question two: Are there differences in sleep quality among older adults who participate in an elder club exercise program, older adults who perform an exercise

program at home, and older adults who do not regularly exercise, controlling for covariates found to be significantly different ($p < .10$) in Aim 1?

3. Determine the extent to which demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity are associated with sleep quality in Thai older adults.

Research question three: What are the associations among demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), physical activity, and sleep quality scores (Pittsburg Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI)?

4. Determine the extent to which pain, depressive symptoms, health conditions, social connectedness, and physical activity predict sleep quality in Thai older adults.

Research question four: How well does the combination of pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity predict sleep quality when controlling for demographic variables (age, gender, educational level, and marital status)?

Hypotheses

Based on the research questions, this investigation tested the following hypotheses.

H₁: There are no differences in demographic variables, health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity (metabolic equivalence of task (MET)/week) among Thai older adults who participate in an elder club exercise program, older adults who perform an exercise program at home, and older adults who do not regularly exercise.

H₂: Sleep quality scores, measured with the PSQI and the ISI, do not differ among older adults who participated in elder club exercise programs, older adults who performed an exercise program at home, and older adults who did not regularly exercise, controlling for covariates found to be significantly different ($p < .10$) in research question 1.

H₃: Scores on the measures of demographic variables, pain, depressive symptoms, health conditions, social connectedness (social networks and social support), and physical activity (MET/week) will not be associated with sleep quality scores (PSQI and ISI).

H₄: After controlling for demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity cannot predict sleep quality scores (PSQI and ISI).

Definition of Terms

The variables used in the study are defined by the following terms.

Demographic variables. Demographic variables refer to age, gender, educational level, marital status, and living status.

Sleep disturbances. Sleep disturbances refer to changes in sleep quality, sleep quantity, and sleep patterns. Several terms in the literature that may be used interchangeably with sleep disturbances include sleep disorders, sleep problems, sleep difficulty, and sleep disruption.

Physical activity behavior. Physical activity behavior refers to all body movements that result in energy expenditure. These activities include exercise activity, household activity, occupational activity, leisure time activities, and transportation.

Exercise habit. Exercise habit refers to action or practices with regard to exercise in which persons perform repeatedly and become everyday life's behaviors. Exercise habit in the current study includes elder club exercise, home exercise, and non-regular exercise.

Elder club exercise. Elder club exercise refers to the group of older adults who currently participate in an elder club exercise program at least twice a week, and they may or may not do additional exercise sessions at home.

Home exercise. Home exercise refers to the group of older adults who currently perform an exercise program at home or other places (e.g., public parks or stadium) but not elder clubs who meet the minimum level of recommendation by the 2008 Physical Activity Guideline for Americans (Carlson, Fulton, Schoenborn, & Loustalot, 2010).

Non-regular exercise. Non-regular exercise refers to the group of older adults who may or may not perform an exercise program at home and do not meet the minimum level of recommendation by the 2008 Physical Activity Guideline for Americans.

Elder club exercise program. Elder club exercise program is an exercise program offered by the local clubs of older adults in each Thai community. An exercise program within each club will combine at least one form of exercises, such as Tai Chi, yoga, aerobic exercise, or traditional exercises (e.g., Thai wand exercise, Norabic exercise, Thai traditional dance, Paslop dance, or fan dance).

Social connectedness. Social connectedness is the interrelationship individuals have with others and their participation in community activities. The term of social connectedness in this study consists of two main aspects, including social network and social support.

Social network. Social network refers to the number of friends or neighbors and family member/relative older adults have a connection and relationship with over a period of time.

Social support. Social support refers to social resources that older adults perceive to be available and actually help them or provide any support related to health and well-being. The support older adults receive is from non-professionals including friends or neighborhoods and family members and relatives.

Health and illness. Health and illness refer to medical and psychological conditions, including pain, depressive symptoms, and health conditions.

Pain. Pain refers to physical discomforts and feelings of suffering that individuals perceived and experienced over that past month. Perception and experiences of pain are multiple dimensions involving physiological function, mood, and social function (Blozik et al., 2007). Persons may report pain in terms of pain intensity, functional limitations, and mood changes because of pain.

Depressive symptoms. Depressive symptoms refer to signs and symptoms with regard to affection, cognition, and somatic problems that persons perceived over the past week (Segal, Qualls, & Smyer, 2011). Participants' responses include feelings of sadness or guilt, feelings of hopelessness, complaints of memory decline, loss of interest in daily activities, and fatigue.

Health conditions. Health conditions refer to medical health problems commonly found in older adults, such as heart diseases, diabetes, cancer, stroke, lung disease, and arthritis.

Conclusion

Sleep disturbances commonly found in older adults are associated with multiple factors affected by age, including a number of comorbidities, pain intensity, the presence of depressive symptoms, and sedentary lifestyles. A lack of sleep can contribute to negative outcomes in various areas of older adult's lives, such as increased risk of falls, impaired cognitive function, intensified medical health problems, and increased depressive symptoms. Researchers have suggested that exercise can improve sleep onset latency, sleep duration, sleep efficiency, and nighttime awakenings, along with reducing medication use. Moreover, since social connectedness is beneficial for elder's physical and psychological well-being, social connectedness could also promote sleep quality. Hence, the combination of exercise participation and social interaction for older adults attending elder clubs may be associated with better sleep quality when compared to older adults who exercise at home and older adults who do not regularly exercise. This study may contribute to the understanding of the role of physical activity and social connectedness gained through elder club exercise participation on sleep quality in older adults.

References

- Alessi, C., & Vitiello, M. V. (2011). Insomnia (primary) in older adults. *BMJ Clinical Evidence, 2011*. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275108/>
- Ancoli-Israel, S. (2009). Sleep and its disorders in aging populations [Supplemental material]. *Sleep Medicine, 10*(1), S7-S11. doi: 10.1016/j.sleep.2009.07.004
- Belza, B. and the Prevention Research Centers-Healthy Aging Research Network Physical Activity Conference Planning Workgroup (2007). *Moving ahead: Strategies and tools to plan, conduct, and maintain effective community-based physical activity programs for older adults*. Centers for Disease Control and Prevention: Atlanta, Georgia. Retrieved from http://www.cdc.gov/aging/pdf/community-based_physical_activity_programs_for_older_adults.pdf
- Blågestad, T., Pallesen, S., Lunde, L. H., Sivertsen, B., Nordhus, I. H., & Grønli, J. (2012). Sleep in older chronic pain patients: a comparative polysomnographic study. *Clinical Journal of Pain, 28*(4), 277-283. doi: 10.1097/AJP.0b013e3182313899
- Blozik, E., Stuck, A. E., Niemann, S., Ferrell, B. A., Harari, D., Renteln-Kruse, W., . . . Clough-Gorr, K. M. (2007). Geriatric pain measure short form: development and initial evaluation. *Journal of the American Geriatrics Society, 55*(12), 2045-2050 2046p. doi:10.1111/j.1532-5415.2007.01474.x
- Buman, M. P., Hekler, E. B., Bliwise, D. L., & King, A. C. (2011). Moderators and mediators of exercise-induced objective sleep improvements in midlife and older

adults with sleep complaints. *Health Psychology, 30(5)*, 579-587.

doi:10.1037/a0024293

Carlson, S. A., Fulton, J. E., Schoenborn, C. A., & Loustalot, F. (2010). Trend and prevalence estimates based on the 2008 Physical Activity Guidelines for Americans. *American Journal Of Preventive Medicine, 39(4)*, 305-313.

doi:10.1016/j.amepre.2010.06.006

Cornwell, B., & Laumann, E. O. (2015). The health benefits of network growth: New evidence from a national survey of older adults. *Social Science & Medicine, 125*, 94-106. doi:10.1016/j.socscimed.2013.09.011

Crowley, K. (2011). Sleep and sleep disorders in older adults. *Neuropsychology Review, 21(1)*, 41-53. doi: 10.1007/s11065-010-9154-6

Deratnay, P., & Sidani, S. (2013). The effect of insomnia on functional status of community-dwelling older adults. *Journal of Gerontological Nursing, 39(10)*, 22-30. doi:10.3928/00989134-20130909-99

Foley, D., Ancoli-Israel, S., Britz, P., & Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: Results of the 2003 National Sleep Foundation Sleep in America Survey. *Journal of Psychosomatic Research, 56(5)*, 497-502.

doi:10.1016/j.jpsychores.2004.02.010

Gottlieb, D. J., Punjabi, N. M., Newman, A. B., Resnick, H. E., Redline, S., Baldwin, C. M., & Nieto, F. J. (2005). Association of sleep time with diabetes mellitus and impaired glucose tolerance. *Archives of Internal Medicine, 165(8)*, 863-868.

Retrieved from <http://archinte.jamanetwork.com/article.aspx?articleid=486518&=rssa>

- Hill, E. L., Cumming, R. G., Lewis, R., Carrington, S., & Le Couteur, D. G. (2007). Sleep disturbances and falls in older adults. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, *62A*(1), 62-66. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/62/1/62.full.pdf+html>
- Jackson, M. L., Sztendur, E. M., Diamond, N. T., Byles, J. E., & Bruck, D. (2014). Sleep difficulties and the development of depression and anxiety: A longitudinal study of young Australian women. *Archives of Women's Mental Health*, *17*(3), 189-198. doi:10.1007/s00737-014-0417-8
- Jirong, Y., Changquan, H., Hongmei, W., & Bi-Rong, D. (2013). Association of sleep quality and dementia among long-lived Chinese older adults. *Age (Dordrecht, Netherlands)*, *35*(4), 1423-1432. doi:10.1007/s11357-012-9432-8
- Jitapunkul, S., & Wivatvanit, S. (2009). National policies and programs for the aging population in Thailand. *Ageing International*, *33*(1-4), 62-74. doi:10.1007/s12126-009-9027-6
- King, A. C., Pruitt, L. A., Woo, S., Castro, C. M., Ahn, D. K., Vitiello, M. V., . . . Bliwise, D. L. (2008). Effects of moderate-intensity exercise on polysomnographic and subjective sleep quality in older adults with mild to moderate sleep complaints. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, *63A*(9), 997-1004. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/63/9/997.full.pdf+html>
- Kraithaworn, P., Sirapo-ngam, Y., Piaseu, N., Nityasuddhi, D., & Gretebeck, K. A. (2011). Factors Predicting Physical Activity among Older Thais Living in Low Socioeconomic Urban Communities. *Pacific Rim International Journal of*

Nursing Research, 15(1). Retrieved from <http://file:///C:/Users/cp98f/Downloads/6539-12690-1-SM.pdf>

Kredlow, M., Capozzoli, M., Hearon, B., Calkins, A., & Otto, M. (2015). The effects of physical activity on sleep: a meta-analytic review. *Journal of Behavioral Medicine*, 38(3), 427-449. doi:10.1007/s10865-015-9617-6

Krishnakumar, A., Narine, L., Soonthorndhada, A., & Thianlai, K. (2015). Family stressors, home demands and responsibilities, coping resources, social connectedness, and Thai older adult health problems: Examining gender variations. *Journal of Aging and Health*, 27(2), 257-283. doi:10.1177/0898264314549658

Mahidol. (2016, January). Population of Thailand. *Mahidol Population Gazette*, 25. Retrieved from <http://fopdev.or.th/en/situation-of-the-thai-elderly-population-situations/>

Manzar, M. D., Sethi, M., & Hussain, M. E. (2012). Humidity and sleep: A review on thermal aspect. *Biological Rhythm Research*, 43(4), 439-457. doi:10.1080/09291016.2011.597621

Mazzotti, D. R., Guindalini, C., Sosa, A. L., Ferri, C. P., & Tufik, S. (2012). Prevalence and correlates for sleep complaints in older adults in low and middle income countries: A 10/66 Dementia Research Group study. *Sleep Medicine*, 13(6), 697-702. doi:10.1016/j.sleep.2012.02.009

McHugh, J. E., Casey, A. M., & Lawlor, B. A. (2011). Psychosocial correlates of aspects of sleep quality in community-dwelling Irish older adults. *Aging & Mental Health*, 15(6), 749-755. doi:10.1080/13607863.2011.562180

- Montgomery, P., & Dennis, J. A. (2002). Physical exercise for sleep problems in adults aged 60+. *The Cochrane Database Of Systematic Reviews*(4). doi: 10.1002/14651858.CD003404
- Nyqvist, F., Forsman, A. K., Giuntoli, G., & Cattan, M. (2013). Social capital as a resource for mental well-being in older adults: A systematic review. *Aging & Mental Health, 17*(4), 394-410. doi:10.1080/13607863.2012.742490
- Ogunbode, A. M., Adebusoye, L. A., Olowookere, O. O., Owolabi, M., & Ogunniyi, A. (2014). Factors associated with insomnia among elderly patients attending a geriatric centre in Nigeria. *Current Gerontology & Geriatrics Research, 1-10*. doi:10.1155/2014/780535
- Ohayon, M. M., Carskadon, M. A., Guilleminault, C., & Vitiello, M. V. (2004). Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: Developing normative sleep values across the human lifespan. *Sleep: Journal of Sleep and Sleep Disorders Research, 27*(7), 1255-1273. Retrieved from https://www.researchgate.net/profile/Michael_Vitiello/publication/8140802_Meta-analysis_of_quantitative_sleep_parameters_from_childhood_to_old_age_in_healthy_individuals_Developing_normative_sleep_values_across_the_human_lifespan_Sleep_27_1255-1274/links/02bfe51226d35f28b1000000.pdf
- Ohayon, M. M., & Partinen, M. (2002). Insomnia and global sleep dissatisfaction in Finland. *Journal Of Sleep Research, 11*(4), 339-346. doi: 10.1046/j.1365-2869.2002.00317.x

- Peltzer, K. (2012). Sociodemographic and health correlates of sleep problems and duration in older adults in South Africa. *South African Journal of Psychiatry, 18*(4), 150-156. doi:10.7196/SAJP.369
- Poolsawat, W. (2007). *Physical activity of the older adults in Bangkok* (Doctoral dissertation, Mahidol University). Retrieved from <https://www.researchgate.net/publication/238755622>
- Rashid, A., Ong, E. K., & Eleanor Shu Yi, W. (2012). Sleep quality among residents of an old folk's home in Malaysia. *Iranian Journal of Nursing & Midwifery Research, 17*(7), 512-519. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3730455/?report=printable>
- Rodriguez, J. C., Dzierzewski, J. M., & Alessi, C. A. (2015). Sleep problems in the elderly. *Medical Clinics of North America, 99*(2), 431-439. doi:10.1016/j.mcna.2014.11.013
- Roveda, E., Sciolla, C., Montaruli, A., Calogiuri, G., Angeli, A., & Carandente, F. (2011). Effects of endurance and strength acute exercise on night sleep quality. *International SportMed Journal, 12*(3), 113-124. Retrieved from https://www.researchgate.net/profile/Giovanna_Calogiuri/publication/235428933_Effects_of_endurance_and_strength_acute_exercise_on_night_sleep_quality/links/5665ccb808ae15e74634bd92.pdf
- Scullin, C. (2015). Top tips for better sleep. *Occupational Health, 67*(7), 16-17 12p. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&aunit=C&aualast=Scullin&atitle=Top+tips+for+better+sleep&title=Occupational+health&volume=67&issue=7&date=2015&spage=16&issn=0029-7917>

- Segal, D. L., Qualls, S. H., & Smyer, M. A. (2011). Aging and mental health, In D. L. Segal, S. H. Qualls, & M. A. Smyer (Eds.), *Depression* (136-157). Massachusetts: Blackwell Publisher.
- Sexton, C. E., Storsve, A. B., Walhovd, K. B., Johansen-Berg, H., & Fjell, A. M. (2014). Poor sleep quality is associated with increased cortical atrophy in community-dwelling adults. *Neurology*, *83*(11), 967-973.
doi:10.1212/WNL.0000000000000774
- Sherrill, D. L., Kotchou, K., & Quan, S. F. (1998). Association of physical activity and human sleep disorders. *Archives of internal medicine*, *158*(17), 1894-1898.
doi:10.1001/archinte.158.17.1894
- Shizheng, D., Jianshu, D., Heng, Z., Shengji, J., Guihua, X., Zengxia, L., . . . Zhiling, S. (2015). Tai chi exercise for self-rated sleep quality in older adults: A systematic review and meta-analysis. *International Journal of Nursing Studies*, *52*(1), 368-379. doi:10.1016/j.ijnurstu.2014.05.009
- Spira, A. P., Covinsky, K., Rebok, G. W., Punjabi, N. M., Stone, K. L., Hillier, T. A., . . . Yaffe, K. (2012). Poor sleep quality and functional decline in older women. *Journal of the American Geriatrics Society*, *60*(6), 1092-1098.
doi:10.1111/j.1532-5415.2012.03968.x
- Sukying, C., Bhokakul, V., & Udomsubpayakul, U. (2003). An epidemiological study on insomnia in an elderly Thai population. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet*, *86*(4), 316-324.
- Suzuki, E., Yorifuji, T., Ueshima, K., Takao, S., Sugiyama, M., Ohta, T., . . . Doi, H. (2009). Sleep duration, sleep quality and cardiovascular disease mortality among

- the elderly: A population-based cohort study. *Preventive Medicine*, 49(2/3), 135-141. doi: 10.1016/j.yjpm.2009.06.016
- Thanakwang, K. (2008). Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Thai Journal of Nursing Research*, 12(4), 243-258. Retrieved from http://www.tnc.or.th/files/2011/05/tnc_journal631/thai_journal_of_nursing_research_vol_12_no_4_oct_33974.pdf
- Thanakwang, K., & Soonthorndhada, K. (2011). Mechanisms by which social support networks influence healthy aging among Thai community-dwelling elderly. *Journal of Aging & Health*, 23(8), 1352-1378. doi:10.1177/0898264311418503
- The Nation Economic and the Social Development Board. (2015). *Aging population: A profile of Thailand*. Retrieved from https://www.m-society.go.th/article_attach/13225/17347.pdf
- Toepoel, V. (2013). Ageing, leisure, and social connectedness: How could leisure help reduce isolation of older adults? *Social Indicators Research*, 113(1), 355-372. doi:10.1007/s11205-012-0097-6
- Uchida, S., Shioda, K., Morita, Y., Kubota, C., Ganeko, M., & Takeda, N. (2012). Exercise effects on sleep physiology. *Frontiers In Neurology*, 3, 48-48. doi:10.3389/fneur.2012.00048
- World Health Organization (2015). *World report on ageing and health*. Retrieved from http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1
- Wu, C. Y., Su, T. P., Fang, C. L., & Yeh Chang, M. (2012). Sleep quality among community-dwelling elderly people and its demographic, mental, and physical correlates. *J Chin Med Assoc*, 75(2), 75-80. doi:10.1016/j.jcma.2011.12.011

- Xiao, Q., Keadle, S. K., Hollenbeck, A. R., & Matthews, C. E. (2014). Sleep duration and total and cause-specific mortality in a large US cohort: Interrelationships With Physical Activity, Sedentary Behavior, and Body Mass Index. *American Journal of Epidemiology*, *180*(10), 997-1006. doi:10.1093/aje/kwu222
- Yang, C.-Y., & Chiou, A.-F. (2012). Predictors of sleep quality in community-dwelling older adults in Northern Taiwan. *The Journal Of Nursing Research: JNR*, *20*(4), 249-260. doi:10.1097/jnr.0b013e3182736461

Chapter Two

Review of the Literature

Chapter 2 will begin with a description of the theoretical framework adopted to frame the current study. Next, the relationships among the theoretical components will be applied to the scientific literature on older adults with sleep disturbances to describe the sleep-wake cycle and the disturbances in the normal sleep cycle with aging, sleep disturbances as a symptom experience in older adults, sleep management strategies, and sleep outcomes. Factors that may influence older adults' symptom experience of sleep disturbances or sleep management will be proposed. Finally, this section will also describe the results of the author's pilot study on sleep disturbances in Thai older adults.

Theoretical Framework

The Symptom Management Model (SMM) (Dodd et al., 2001) is used to guide the current study. The SMM has been used frequently as a basis for research related to symptom management and measured outcomes. Skelly, Leeman, Carlson, Soward, and Burns (2008) applied this conceptual model to form a community-based intervention for self-management in older adults with diabetes. It was selected to guide the current study because the SMM clearly explains the interrelationship among the three main dimensions of the model, including symptom experience, symptom management strategies, and symptom outcomes. The current study examines the relationship among sleep disturbances as a symptom experience, exercise habits, and physical activity as symptom management strategies, and sleep quality as symptom outcomes. The theoretical framework as applied to this study is illustrated in Figure 2.1.

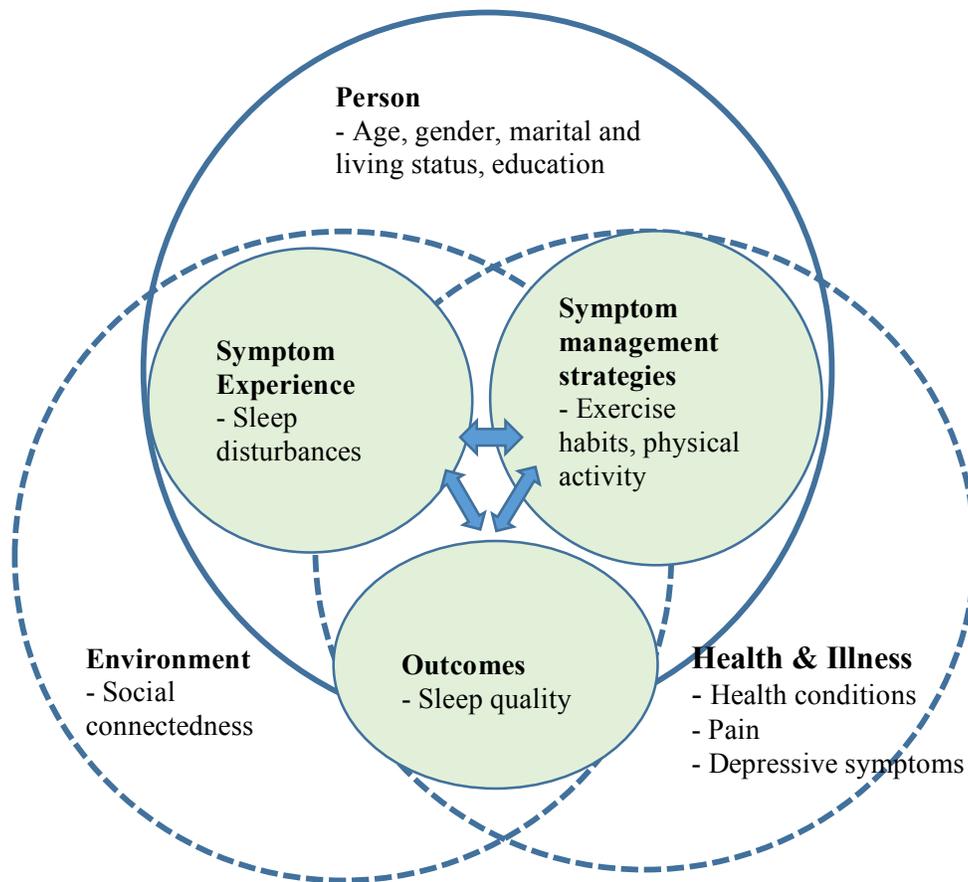


Figure 2.1 The SMM adopted for the current study

According to the SMM, the first dimension is symptom experience. Persons perceive symptoms related to whether they notice a change from the way they feel or behave; following this, they evaluate and make decisions and judgements about the severity, cause, treatability, and the effects of symptoms on their lives (Dodd et al., 2001). Given the symptom perception process, persons will react to their symptoms using physiological, psychological, and behavioral responses. As the symptom experience can change over time, it may be difficult for persons to detect it. The symptom does not need to be experienced by persons before initiating the symptom management strategy.

The second dimension is symptom management strategies. Symptom management strategies are actions a person uses to prevent or delay consequences

regarding symptom's effects (Dodd et al., 2001). Symptom management strategies can be biomedical, professional, or self-care strategies. Dodd et al. (2001) suggest specifying several aspects for designing, developing, and implementing strategies. These include the nature of strategies, persons who deliver strategies, place, time, and periods of strategy implementation. Strategies can be initiated before or after persons experience a symptom. The types of strategies persons will select depend on individual outcomes and other factors, such as personal, health, and environmental factors.

The third dimension is symptom outcomes. Symptom experience and symptom management strategies yield symptom outcomes. Symptom outcomes consist of multiple forms that can be related to each other, including improved symptoms, gained competencies of self-care, improved functional and emotional status, and increased mobility and quality of life (Dodd et al., 2001). Regarding outcome assessment, the duration of evaluation varies depending on how long an intervention or a strategy takes to alleviate the symptom. Besides the duration of evaluation, adherence also potentially influences positive outcomes of symptom management strategies (Dodd et al., 2001). In this study, exercise is hypothesized to promote sleep if older adults perform exercise regularly. In addition, increasing levels of physical activity would have a positive relationship with sleep quality.

The aforementioned three domains can be influenced by the contextual factors of person, health and illness, and environment (Dodd et al., 2001). First, personal factors refer to demographic, psychological, sociological, physiological, and developmental variables (i.e., levels of development or maturation) that all influence the way in which people view and respond to their symptom experiences. For instance, knowing that age-

related changes in the normal sleep cycle can disturb sleep quality, some people accept that their sleep problems are a part of the normal aging process (Neikrug & Ancoli-Israel, 2010; Rodriguez et al., 2015).

Second, health and illness addressed by Dodd et al. (2001) refers to variables unique to individuals' health conditions, along with risk factors, injuries, or disabilities. These variables may affect symptom experiences, management strategies, and symptom outcomes in different ways. For example, people with chronic pain may experience poorer nighttime sleep than those without chronic pain; they may choose to take medicine or listen to music rather than exercise to improve sleep.

Finally, the environment is the context in which symptoms occur. The environment includes physical (home, work, and hospital), social (social support, social network, and interpersonal relationships), and cultural (beliefs, values, and practices unique to one's identified ethnic, racial, or religion groups) factors (Dodd et al., 2001). For example, low social network and social support may lead to inactivity and isolation. Beckett, Goldman, Weinstein, Lin, and Chuang (2002) found that infrequent contact with friends was significantly associated with poor health status and increased depressive symptoms. Similar findings have also been found in a study examining associations among social disconnectedness, social isolation, and physical and mental health in older adults (Cornwell & Waite, 2009). When exploring the nature of sleep conditions and related factors, Yao, Yu, Cheng, and Chen (2008) suggested that social network factors, particularly the relationships with relatives and friends, are important determinants of sleep quality in older adults.

To summarize from the model in Figure 1, exercising is the key strategy to promote sleep, even though older adults may or may not experience sleep disturbance symptoms before they engage in exercise sessions at elder clubs or perform exercise at home. Furthermore, engaging in elder club exercise sessions also offers older participants social activities and connectedness. Therefore, the study aims to identify whether physical activity alone or in combination with elder club-social interaction is associated with the outcome of sleep quality. Influencing factors of sleep quality in this study can be categorized into personal, health and illness, and environment. Personal factors include age, gender, educational level, marital status, and living status. Health and illness factors consist of pain, depressive symptoms, and the number of health conditions. The environmental factor is social connectedness, which includes the aspects of social network and social support.

The Sleep-Wake Cycle and the Disturbances in the Normal Sleep Cycle with Aging

The sleep-wake cycle. The sleep-wake cycle is controlled by a combination of homeostasis and circadian rhythms (National Sleep Foundation, 2006). Homeostasis is the process by which body balances internal systems such as blood pressure, body temperature, and acid-base balance to control the sleep-wake cycle (National Sleep Foundation, 2006). In particular, sleep homeostasis drives people to increase the need for sleep gradually from the time they awaken until a peak is reached in the late evening. The sleep drive thereby affects the amount of sleep a person needs each night. Although how this process occurs is unclear, some sleep experts postulate that the sleep-inducing neurotransmitter adenosine increases sleep drive (National Sleep Foundation, 2006).

Circadian rhythms, on the other hand, regulate the timing of sleep and wakefulness (Brown, Basheer, McKenna, Strecker, & McCarley, 2012; Vaz Fragoso & Gill, 2007). Circadian rhythms refer to the fluctuations of cyclic changes that occur over a 24-hour period, including body temperature, blood pressure, hormone levels, and sleep-wake cycles (National Sleep Foundation, 2006). The circadian sleep-wake rhythm is the process by which the circadian pacemakers known as the biological clock, located in the suprachiasmatic nucleus of the hypothalamus, respond to external stimuli, such as the physical environment and social or work schedules (Crowley, 2011; Neikrug & Ancoli-Israel, 2010). With respect to this process, people tend to sleep and wake up at almost the same time every day.

Circadian sleep-wake rhythms in humans rely on physical environment factors as light and darkness that set the circadian clock and help to determine when people feel the need to wake up and go to sleep over 24 hours a day (National Sleep Foundation, 2006). Circadian sleep-wake rhythms also work in accordance with the variation of core body temperature. In particular, individuals experience a drop in core body temperature at night, which drives sleepiness; as morning approaches, the core body temperature rises, which causes people to wake up (Neikrug & Ancoli-Israel, 2010). In addition to physical environment factors, hormone secretion related to sleep drive, especially melatonin, influences circadian rhythms (Zisapel, 2001). The level of melatonin rises at night, which helps drive the need for sleep; it reaches the maximum level around 3 to 4 a.m. before declining in the daytime (Khullar, 2012). Thus, a decline in melatonin secretion levels and desynchronization with time cues, such as light and darkness, can also disrupt circadian sleep-wake cycles (Crowley, 2011). Because light exposure is necessary for the

timing of sleep and wakefulness, exposure to the normal cycle of light and darkness help maintain normal sleep-wake cycles (Millman, 2012).

The normal sleep cycle consists of non-rapid eye movement (Non-REM) sleep and rapid eye movement (REM) sleep (National Sleep Foundation, 2006; Wolkove, Elkholy, Baltzan, & Palayew, 2007). Non-REM sleep is subdivided into four stages, which are grouped into light sleep and slow-wave sleep (SWS) or deep sleep. Light sleep consists of stage 1 and stage 2, and deep sleep is comprised of stage 3 and stage 4. Sleep progressively deepens from light sleep to deep sleep; in stage 4 of deep sleep, it is difficult for persons to be awakened (Saccomano, 2014).

The normal sleep-wake cycle runs from non-REM sleep to REM sleep (National Sleep Foundation, 2006; Saccomano, 2014; Wolkove et al., 2007). Each sleep cycle lasts about 90 to 120 minutes and repeats itself four to six times over the course of a night (National Sleep Foundation, 2006). About 75 to 80% of sleep cycles are spent in non-REM sleep, with the additional 20 to 25% spent in REM sleep (Saccomano, 2014). Within a sleep cycle, more time is spent in deep sleep when first falling asleep (Nagel, Markie, Richards, & Taylor, 2003). As the night's duration of sleep progresses, time spent in REM sleep constantly increases and non-REM sleep decreases, with stage 2 predominating non-REM sleep (Colten & Altevogt, 2006). Although people spend more than 50% of sleep in non-REM sleep, deep sleep and REM sleep are important to good health and well-being.

Differences in physiology occur in each sleep stage. As people approach stage 1, eyelids begin to drop with slow eye movements, and in stage 2, muscle activity, body movement, blood pressure, and heart rates decrease (Wolkove et al., 2007). Cortisol and

thyroid stimulating hormones decrease and body temperature and metabolic rate begin to drop (Izac, 2006). Deeper sleep (stage 3 and 4) presents with slow brain waves called delta waves (National Sleep Foundation, 2006). Growth and parathyroid hormone are secreted along with constantly decreasing metabolic rates, cerebral blood flow, heart and respiratory rates, and body temperature (Gooneratne & Vitiello, 2014; Izac, 2006). Research examining changes in sleep architecture relative to growth hormone suggested an association between decreased levels of growth hormone secretion and a decline in the non-REM sleep phase (Van Cauter, Leproult, & Plat, 2000).

In REM sleep, on the other hand, heart rate, respiratory rate, blood pressure, and brain activities increase (Gooneratne & Vitiello, 2014). Voluntary muscles are inhibited, and cerebral blood flow and metabolic rates drop continuously until they approach levels of the awake stage (Izac, 2006). However, neurotransmitters replenish during REM sleep, which organizes the neural network for memory, learning, and problem solving (Brown et al., 2012; Saccomano, 2014). With regard to physiological changes in each stage of sleep, deep sleep and REM sleep are considered restorative stages where physiological, neurological, and hormonal restoration and repair occurs (Nagel et al., 2003). The normal sleep cycle and physical change in each sleep stage are presented in Figure 2.2.

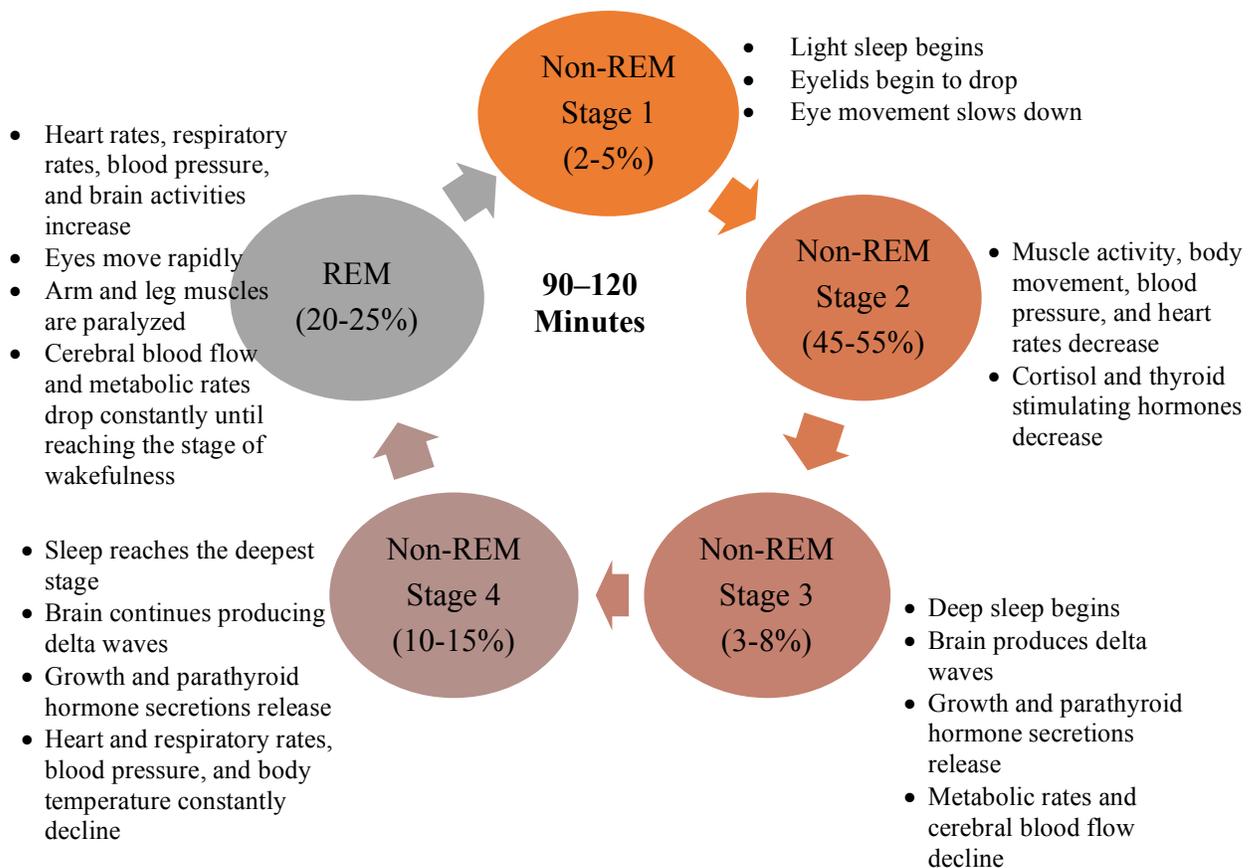


Figure 2.2 The normal sleep cycle and physiological changes in each sleep stage

Disturbances in the Sleep Cycle Related to Aging. Multiple reviews on research studies examining objective and subjective sleep certainly indicate changes in the normal sleep cycle and circadian rhythms that gradually occur with advanced age (Ancoli-Israel, 2005; Crowley, 2011; Gooneratne & Vitiello, 2014; Vaz Fragoso & Gill, 2007). Age-related changes in the normal sleep cycles can reflect both a weakening of the sleep-promoting process and a strengthening of the wake-promoting process (Putilov, Munch, & Cajochen, 2013). A meta-analysis of 64 sleep studies published between 1960 and 2003 in more than 35,000 healthy participants from childhood to old age provides multiple profound aspects of age-related changes in sleep architecture (Ohayon et al.,

2004). The results show that older adults spend longer time in light sleep (stage 1 and 2) and less time in deep sleep (stage 3 and 4) and REM sleep than do younger adults. Van Cauter et al. (2000) conducted an experimental study in which healthy participants were admitted in a three night sleep laboratory and found a significant decrease in the percentage of deep sleep from 18.9 % ($SD = 1.3$) in early adulthood (age 18-25 years) to 3.4% ($SD = 1.0$) at the midlife (age 38-50 years), and then remained unchanged. Time spent in REM sleep, on the contrary, decreased by 10 minutes in every decade after age 60 years old. Reduced deep sleep and REM sleep are due in part to the increasing proportion of time spent in light sleep that makes older adults wake easily after sleep onset or awoken during the night (Millman, 2012). Changes in the normal sleep cycle are presented in Figure 2.3.

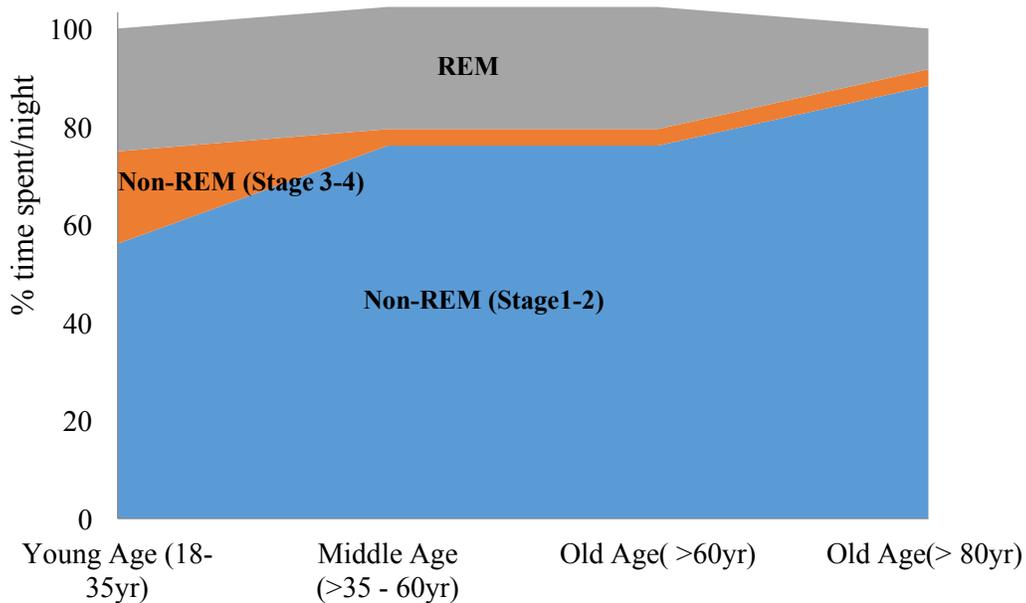


Figure 2.3 Changes in the normal sleep cycle from young adults to older adults

Alterations in the normal sleep cycles and circadian rhythms are reflected by multiple changes in sleep parameters as measured by polysomnography or actigraphy. In a sample of healthy individuals, sleep duration slightly decreased from young adults (6.5 – 8.5 hours a night) to older ages (5 – 7 hours a night) and remained unchanged after age 60 (Ohayon et al., 2004). However, a survey of 2,000 U.S. adults revealed that short sleep duration was more common in young adults aged 20 – 59 years than in older adults ages older than 60 (Centers for Disease Control and Prevention, 2011). In the same fashion with sleep duration, sleep efficiency, used to indicate sleep quality, constantly decreased with age (Ohayon et al., 2004). These findings are congruent with the conclusion drawn by Li et al. (2013), which found that older participants age 80 or over reported a lower percentage of sleep efficiency than participants aged 60 – 69.

Sleep latency and awakening during the night increase with age (Crowley, 2011; Neikrug & Ancoli-Israel, 2010; Rodriguez et al., 2015). The same study in rural Chinese older adults indicated that the 60 to 69, 70 to 79, and over 80 age groups' self-reported sleep latency were 34.74 (*SD* =28.64), 39.18 (*SD*=29.22), and 42.35 (*SD*= 37.01) minutes, respectively (Li et al., 2013). Regarding the longest time spent falling asleep, people aged 80 and over are most likely to live with sleep difficulties rather than those who are younger than 80 years old. In addition, Crowley (2011) asserted that as people age, sleep fragments also increase that make older adults frequently awake during the night. In accordance with this evidence, a meta-analysis exploring changes in sleep over the lifespan showed that after the age of 30, people spent longer time wakening after sleep onset by 10 minutes per a decade (Ohayon et al., 2004). Regarding this change,

disturbances in sleep can start when people move into middle age and tend to increase when people get older.

Growing evidence also suggests an alteration of circadian rhythms that partly accounts for the disruption in the normal sleep cycles (Ancoli-Israel, 2005; Crowley, 2011; Espiritu, 2008; Neikrug & Ancoli-Israel, 2010). A possible reason is that circadian rhythms become weaker and desynchronized with age (Neikrug & Ancoli-Israel, 2010; Saccomano, 2014). Münch et al. (2005) explored circadian rhythms in young and older healthy participants. Participants were asked to stay in a sleep laboratory under controlled conditions of sleep-wake duration, light, meals, and water for 40 hours. The findings showed an increasing weaker circadian arousal signal with age, based on increased occurrences of sleep during the wake maintenance and higher subjective sleepiness ratings in the late afternoon and evening in the older group (Münch et al., 2005).

In conclusion, sleep-wake cycles in humans are controlled by the mechanism of homeostasis and circadian rhythms. The normal sleep-wake cycle consists of two components, which are non-REM sleep and REM sleep. Non-REM sleep is comprised of four sub-stages: light sleep (stage 1 and stage 2) and deep sleep (stage 3 and stage 4). This normal sleep cycle runs from Non-REM sleep to REM sleep and repeats itself throughout a full night's sleep. Age-related disturbances in the normal sleep cycle and circadian rhythms include longer time spent in the light sleep and less time spent in the deep sleep and REM sleep. With these alterations, sleep latency and frequency of awakening after sleep onset increase while sleep duration and sleep efficiency decrease. Given these changes, older adults are more likely than young adults to experience sleep disturbances.

Sleep Disturbances as a Symptom Experience

Sleep disturbances are defined as changes in sleep quality, sleep quantity, and sleep patterns (Krystal & Edinger, 2008). However, experiences in sleep disturbances may differ among individuals based on how they perceive and evaluate their sleep conditions. Buysse, Reynolds, Monk, Berman, and Kupfer (1989) have explained sleep disturbance as a complex phenomenon that is difficult to define and measure objectively. Harvey, Stinson, Whitaker, Moskowitz, and Virk (2008) explored the subjective meaning of sleep quality in older adults and suggested that older participants with or without sleep conditions judged their sleep quality by feeling rested and restored on waking as well as feeling alert throughout the day. This study also highlights other perceptions of sleep quality for older adults whose scores indicated poor sleep, including how well they sleep, and how often they awake during the night (Harvey et al., 2008). Likewise, Chen, Waite, Kurina, et al. (2015) found that in older adults, short sleep time was a significant predictor of perceived sleep disturbances. Importantly, older adults who experienced earlier morning awakenings were more likely to feel unrested upon waking up than those who did not (Mazzotti et al., 2012).

Sleep disturbances have been linked to daytime sleepiness (Ohayon, 2008). Chung (2005) examined a relationship of poor sleep conditions and sleepiness in daytime and suggested that participants who had short sleep duration or insufficient sleep at night will also experience sleepiness in the following day. In line with the first study, short sleep duration and poor perceived sleep quality were found to be the potential predictor of increased sleepiness (Liu et al., 2000). However, Pilcher, Schoeling, and Prosansky (2000) conducted a research study to determine to what extent self-reported sleep habits

can predict subjective sleepiness, and their findings indicated that sleep quality was a better predictor of participants' sleepiness than sleep quantity. Other sleep disturbances have been found to increase self-reported daytime sleepiness, including difficulty falling asleep, difficulty maintaining sleep, and early morning awakening at least three times per week over the past month (Hara et al., 2011).

Older adults experience a variety of sleep conditions and one of the most common sleep conditions is insomnia (Ancoli-Israel, 2005, 2009; Crowley, 2011; Rodriguez et al., 2015; Sateia, 2014). Insomnia is defined by experiences with difficulties of sleep initiation and sleep maintenance, early morning awakenings, and daytime dysfunction (feeling unrested and daytime sleepiness) at least three nights per week for three months (Sateia, 2014). Data from the 2003 National Sleep Foundation's annual Sleep in America poll found that up to 50 % of older participants had complaints with insomnia symptoms (Foley et al., 2004). This number is higher than the prevalence of insomnia symptoms found in Asian countries like China, which was 32.9 % (Liu & Liu, 2005). Another cross-sectional study in Nigerian older adults found that 27% of more than 800 participants experienced at least one condition of insomnia every night for more than two weeks (Ogunbode et al., 2014). However, in Thailand, Sukying et al. (2003) conducted a national sleep survey in over 40,000 older participants and found that 46.7% had trouble with insomnia conditions (Sukying et al., 2003).

Sleep disturbances can be problematic. In other words, as a result of sleep disturbances or poor sleep quality, older adults increase their likelihood of experiencing negative consequences on various aspects of their lives, including physical, psychological, cognitive, and social function. Specifically, insufficient sleep has been

linked to increased risk of chronic health problems, including diabetes and cardiovascular diseases (Arora et al., 2011; Gottlieb et al., 2005; Iftikhar et al., 2015; Sampaio, Sewo Sampaio, Yamada, Tsuboyama, & Arai, 2014; Strand et al., 2015). Improving sleep quality, in turn, has the potential to reduce the biomarkers that cause metabolic and cardiovascular diseases (Carroll et al., 2015). Also, sleep disturbances can be a major cause of physical fatigue that results in diminished physical function and participation in social events (Deratnay & Sidani, 2013; Lee et al., 2013). Some studies demonstrated that older adults with poor sleep quality had a higher frequency of falls than those with better sleep quality (Hill et al., 2007; Kawamoto & Doi, 2002; Mesas, López-García, & Rodríguez-Artalejo, 2011).

Evidence also shows that older adults with sleep disturbances can experience impaired cognitive function or dementia, especially for those whose sleep duration is less than five hours or more than nine hours per night (Cricco, Simonsick, & Foley, 2001; Miyata et al., 2013). Jirong et al. (2013) emphasized that older adults with poor sleep quality were 1.76 times more likely to develop a cognitive impairment than those with good sleep quality. A decline in cognitive function may be caused by insufficient sleep that contributes to increased atrophy in brain structures (Sexton et al., 2014). In addition to these consequences of sleep disturbances, poor sleep quality can predict poor psychological well-being (Hanson & Ruthig, 2012). Similarly, results from a longitudinal study exploring the impact of sleep difficulties on psychological consequences indicated that poor sleep could precede the onset of anxiety and depression (Jackson et al., 2014).

Sleep Management Strategies

From a SMM perspective, the symptom experience of sleep disturbances may lead older adults to try various strategies to improve their quality of sleep. Some people, however, may perform strategies to promote sleep before they experience their sleep problems. As in the proposed study, physical activity and social connectedness gained through exercise club participation may be related to sleep quality in older adults.

Exercising has been known for its physical, psychological, and social benefits for all age groups. As such, older adults who engage in exercise programs at elder clubs may gain more physical activity levels and connections with friends or others than those who do not participate. These benefits may further promote their sleep. Thus, this section provides a definition of physical activity, a summary of physical activity practices in older adults, and a review of physical activity effects on sleep quality in older adults.

Definition of physical activity and practicing in older adults. Physical activity refers to any form of movement that results in energy expenditure and includes all activities of daily living (Chennaoui, Arnal, Sauvet, & Léger, 2015). Physical activity consists of four components: leisure-time physical activity, occupational physical activity, household physical activity, and transportation physical activity (Fei, Norman, & While, 2013). Of all the components, leisure-time activity or physical exercise is commonly used as a criterion for physical activity recommendations. Increased physical activity benefits older adults by enhancing physical function, reducing the risk of chronic diseases, and improving mental health and the quality of life (Binhosen et al., 2003; Haight, Tager, Sternfeld, Satariano, & van der Laan, 2005; Hui & Rubenstein, 2006).

The 2008 Physical Activity Guidelines for Americans recommend that adults should participate in moderate-intensity activity for at least 150 minutes per week (as aerobically active) to obtain substantial health benefits and more than 300 minutes per week (as highly active) to obtain more extensive health benefits (Carlson, 2010). However, less than half of older adults (31.1%) worldwide are physically active (Hallal et al., 2012). A systematic review of 53 studies on physical activity in older adults published from 1999 - 2011 indicated a substantial numbers of older adults did not engage in physical activity to promote their health, and the lowest percentage was found in Asian countries (Fei et al., 2013). In Thailand, although almost 60 % of older adults routinely engaged in physical activity, only 20% met the national health policy goal of physical activity recommendation (Kraithaworn et al., 2011). In recognition of older adults' generally low activity levels, the Thai government has established the Healthy Thailand Project and created clubs in all sub-districts to provide exercise programs and health promotion instruction since 2005 (Jitapunkul & Wivatvanit, 2009). Participation in exercise sessions and other recreation activities helps older adults increase their level of physical activity (Poolsawat, 2007).

The effect of physical activity and physical exercise on sleep outcomes.

Physical activity has a positive relationship with sleep quality. A large body of research has examined physical activity as a predictor of sleep disturbances and found that as physical activity levels increase, sleep disturbances or poor sleep quality tend to improve (Chiu-Yueh & Ai-Fu, 2012; Foley et al., 2004; Holfeld & Ruthig, 2014; Inoue et al., 2013; Mazzotti et al., 2012; Wu et al., 2012). In contrast, older adults with sedentary lifestyles reported higher insomnia symptoms than those with active lifestyles (Chiu-

Yueh & Ai-Fu, 2012; Ogunbode et al., 2014). In addition to physical activity influencing sleep quality, Holfeld and Ruthig (2014) suggested that sleep quality contributed to older adults' levels of physical activity because better sleep quality promoted more physical activity and poorer sleep quality predicted less physical activity. Good sleep quality and high sleep efficiency can also predict greater daily activity counts or higher physical activity behaviors for the following day (Dzierzewski et al., 2015; Lambiase, Gabriel, Kuller, & Matthews, 2013). Baron, Reid, and Zee (2013) found that short sleep duration and feelings of sleepiness can interfere with participation in exercise sessions. Some sleep experts have explained that poor sleep quality or sleep disturbances interfere with alertness, vitality, and mood state, and contributes to perceptions of greater exertion during exercise, which decreases maximal levels of performance (Chennaoui et al., 2015). In brief, the relationship between physical activity and sleep quality is bidirectional.

Increased levels of physical activities can improve sleep outcomes. For over a decade, numerous experimental design studies have examined the effect of physical activity on sleep in older adults through exercise participation (Bloch, 2014; Erlacher, Erlacher, & Schredl, 2015; Gebhart, Erlacher, & Schredl, 2011; Khamrani, Shams, Dehkordi, & Mohajeri, 2014; King, Oman, Brassington, Bilwise, & Haskell, 1997; Pa et al., 2014; Wang & Youngstedt, 2014). Kredlow et al. (2015) conducted a recent meta-analysis of 66 studies published from 1991 to 2013 to examine the effect of physical activity on sleep in healthy adults. Results from this study highlighted the benefit of both acute exercise as defined by exercise of less than one week's duration and regular exercise as indicated by equal or more than one week of exercise participation on a

variety area of sleep outcomes. Individuals who participated in acute exercise had a small to medium improvement in sleep latency, total sleep time, sleep efficiency, and duration of the deep sleep stage (Kredlow et al., 2015). However, positive changes in sleep outcomes of acute exercise among good sleepers may be limited due to ceiling and floor effects (Passos, Poyares, Santana, Tufik, & Mello, 2012). Study participants who performed regular exercise at a medium-high level had a greater improvement in almost all components of sleep outcome measures than control participants who did not exercise (Kredlow et al., 2015). These positive sleep outcomes included sleep latency, sleep duration, sleep efficiency, numbers of nighttime awakenings, daytime sleepiness, and overall sleep quality. Accordingly, it is plausible that the benefits of exercise for sleep can be recognized immediately, with exercise influencing an acute positive outcome on many important aspects of sleep.

Exercise has been suggested as a preventive technique and an alternative treatment for long-term sleep conditions, particularly for chronic insomnia. A cross-sectional, longitudinal study of over 10,000 community-dwelling Chinese older adults provides important findings that support the benefits of exercise on insomnia prevention (Inoue et al., 2013). All studied participants were asked to report both insomnia symptoms and the days a week when they spent 30 minutes or more on each physical activity at the study's baseline and at a 3-year follow-up to the study. The results demonstrated that habitual exercise was related to a lower prevalence of insomnia (Inoue et al., 2013). Another study examining the effects of exercise on chronic insomnia showed that performing long-term exercise (12 weeks to 12 months) effectively reduced insomnia symptoms and other sleep complaints; exercise presented similar effectiveness

when compared with a long-term pharmacological treatment (1 to 8 weeks) (Passos et al., 2012).

Although how physical activity or exercise influences sleep is inconclusive, several systematic review studies have explained the effect of physical activity or exercise on sleep by multiple pathways (Chennaoui et al., 2015; Passos et al., 2012; Uchida et al., 2012). Those pathways can be classified into acute and chronic effects. Acute effects of exercise involve the central nervous system (CNS) of sleep, thermoregulatory, and mood (Passos et al., 2012; Uchida et al., 2012). First of all, exercise affects the central nervous system (CNS) of sleep by increasing time spent in the slow wave sleep (stage 3 and 4) during the corresponding night (Kredlow et al., 2015). Second, increases in core body temperatures resulted from exercising can facilitate sleep due to the activation of heat dissipation mechanisms that are controlled by the hypothalamus (Passos et al., 2012). Last, exercise has beneficial effects on mood by reducing anxiety symptoms (Herring, O'Connor, & Dishman, 2010). Since anxiety is an important factor leading to sleep disturbances, exercise promotes sleep through mood control.

Similar to the acute effects of exercise, strong evidence supports that exercise influences mood control by reducing depressive symptoms along with improving sleep quality (Gebhart et al., 2011; Lo & Lee, 2014; Passos et al., 2012; Reid et al., 2010). In addition to mood effects, long-term or regular exercise induces endocrine function by increasing the amount of daily growth hormone release that might directly affect sleep quality; a greater change in levels of growth hormone has been found in those who have regular exercise (Uchida et al., 2012). Also, long-term exercise may indirectly influence

sleep by increasing changes in somatic functions that include long-term improvements in body composition, basic metabolic rate, cardiac function, glycemic control, and immune function (Uchida et al., 2012). All changes are related to a decrease in the risk of chronic health problems, and that change further prevents sleep disturbances.

Exercise that promotes sleep in older adults may be influenced by the type, intensity, and duration or time of exercise.

Types of exercise. Various types of exercise that promote sleep and are safe for older adults can be categorized into two groups regarding whether mindfulness components are combined: mind-body exercise and non-mind-body exercise (King et al., 2008; Kredlow et al., 2015; Shizheng et al., 2015). Mind-body exercise or mindfulness-based training for physical activity is illustrated as Tai Chi, qigong, yoga, and Pilates (Kennedy & Resnick, 2015). Tai Chi is a common form of traditional Chinese mind-body exercise used for sleep promotion in older adults (Irwin, Olmstead, & Motivala, 2008; Lo & Lee, 2014; Taboonpong, Puthsri, Kong-In, & Saejew, 2008). A meta-analysis of the effect of Tai Chi on sleep showed that it has a beneficial effect on sleep quality in older adults by increasing overall sleep quality, sleep duration, and sleep efficiency, as well as decreasing sleep latency and daytime fatigue (Du et al., 2015). Importantly, greater improvements of sleep outcomes were seen in older adults whose initial scores indicated poor sleep quality than those with better sleep quality (Irwin et al., 2008). Moreover, participants who performed Tai Chi reported sleep latency of 18 minutes less per night and sleep duration of 48 minutes more per night from the baseline; they also reported an improvement in daytime sleepiness (Li et al., 2004).

The other form of exercise is non-mind-body exercise or non-mindfulness based training for physical activity. In sleep literature, non-mind-body exercise adopted to promote elder's sleep quality may take multiple forms, including aerobics (brisk walking, stationary bicycle, and treadmill), strength, and stretching exercises (Erlacher, Erlacher, Schredl, 2015; Roveda et al., 2011; Shams, Kamrani, Dehkordi, & Mohajeri, 2013; Yang, Ho, Chen, & Chien, 2012). Previous studies provide evidence of the benefits of non-mind-body exercise for both objective sleep outcomes and subjective sleep quality (Flausino, Da Silva Prado, De Queiroz, Tufik, & De Mello, 2012; Shams et al., 2013; Wang & Youngstedt, 2014). To study objective sleep outcomes, Buman, Hekler, Bliwise, and King (2011) conducted a randomized controlled trial among initially underactive participants (age 55–79 years) with mild-moderate sleep disturbances. All participants were asked to join in a 12-month long program of brisk walking and aerobic movement. Results showed participants had significant improvements in sleep quality by decreasing time spent in stage 1 - 2 and number of awakenings during the night; the study also found participants has increased sleep efficiency (Buman, et al., 2011).

Similarly, in a quasi-experimental study older participants who performed a 12-month aerobic exercise reported significantly improved quality of sleep, more adequate sleep time or sleep duration, and decreased daytime sleepiness (Hang & Jiaojiao, 2013). These findings are in line with another randomized controlled trial of a 16-week aerobic exercise plus sleep hygiene education program for inactive older adults with insomnia; this study found better self-reported sleep quality and longer sleep duration after completing the exercise program (Reid et al., 2010). When comparing bicycling and running, bicycling resulted in a significantly moderate beneficial effect on the slow wave

sleep after a single bout of exercise ($d = 0.49, p = .04$), while running resulted in a non-significant effect ($d = -0.04, p = .71$) (Kredlow et al., 2015). Kredlow et al. also found the effect size for non-mind-body exercise on sleep quality ($d = 0.48$) was smaller than that of mind-body exercise ($d = 0.98$), but the difference between these two groups was not significant ($Q = 3.37, df = 1, p = .07$).

Although many exercise forms for the elderly exist, those aforementioned exercises are often culturally based exercise like Tai Chi while others are general forms of exercise, such as walking, bicycling, and treadmill. The enhancement of exercise of older adults should be adjusted according to cultural context, tradition, and needs in order that the exercise can be included as part of habitual activities to make it easy for older adults to participate (Janyacharoen, Laophosri, Kanpittaya, Auvichayapat, & Sawanyawisuth, 2013). Thus, in Thailand, several other cultural-based exercises have been applied to promote health and well-being for the elderly, including Thai wand exercise and traditional dance.

One type of cultural-based exercise is the Thai wand exercise, a form of exercise that utilizes a wand for a series of exercises in which flexibility, endurance, balance, and diaphragmatic breathing exercise are combined (Wichitsrano, Pilarit, Klomkamol, Ploynamngern, & Wongsathikun, 2011). The intensity of this exercise can be increased by lifting the wand in an upper limb exercise or decreased by using the wand to support the body (Peungsuwan et al., 2014). Another type of cultural-based exercise is traditional dance, which is considered an aerobic exercise and is similar to Tai Chi but is more complex with posture expectations and a focus on coordination (Peungsuwan et al., 2014). Traditional dance that is popular among Thai elders includes Norabic exercise

(dancing with Southern music) (Tantipongwiwat & Kong-In, 2012), Thai traditional dance (a slow continuous dance with Thai classical music with consistent rhythms) (Janyacharoen et al., 2013), and Paslop dance (Laos's traditional dancing in which walking and twisting patterns of movement are combined with music) (Kanhachon, Boonprakob, Wanpen, & Boontha, 2014).

Previous studies have emphasized that traditional exercises such as the Thai wand exercise increase muscle strength, endurance, and flexibility (Jarupunt, Paokanha, Subgranon, & Piputvawanicha, 2011; Peungsuwan et al., 2014). Moreover, in a study of a 45-minute Paslop dance, participants who performed this exercise three times per week for four weeks reported similar improvements in body balance and core muscle strength as participants who performed the specific stabilizing exercise (Kanhachon et al., 2014). According to a study of older adults who practiced Norabic exercise, the results displayed a significant increase in physical fitness, cardiopulmonary endurance, and flexibility after completing the program (Tantipongwiwat & Kong-In, 2012). Not only did traditional exercises improve physical performance in Tantipongwiwat and Kong-In's (2012) study, practicing the Thai wand exercise reduced depressive symptoms in Jarupunt et al.'s (2011) experimental study of nursing home residents. Since depression and physical health status may contribute to sleep disturbances in older adults, traditional exercise could help older adults gain better sleep quality.

Intensity of exercise. Intensity of exercise is classified into three levels based on the metabolic equivalence of task (MET) that includes low or light-intensity exercise (MET < 3), moderate-intensity exercise (MET = 3 – 5.9), and high or vigorous-intensity exercise (MET ≥ 6) (Stewart et al., 2001). Recent studies of the sleep-promotion effect of

exercise in older adults have focused on exercise of moderate intensity (Gebhart et al., 2011; Lo & Lee, 2014; Shams et al., 2013; Yang et al., 2012). These studies suggested that the influence of exercise on sleep quality varies with regard to intensity of exercise. Wang and Youngstedt (2014) investigated the effect of light and moderate intensity exercise on sleep in older female participants with sedentary lifestyles and found a significant improvement in wake time after sleep onset and number of awakenings after moderate-intensity aerobic exercise. Although no significant differences in sleep parameters after light intensity aerobic exercise were found in this study, the values of these parameters were between those after the moderate intensity exercise and those without exercise (Wang & Youngstedt, 2014). These results support a greater sleep-promoting effect of moderate intensity aerobic exercise that has been found in male older participants (Shams et al., 2013). On the other hand, the benefits of high intensity exercise for better sleep in older adults are inconclusive (Kredlow et al., 2015). Specifically, one randomized controlled trial found little impact from high intensity physical resistance exercise on sleep outcomes regarding increasing total sleep time and sleep efficiency (Richards et al., 2011).

Duration and time of exercise. Previous research studies carried out sleep benefits' exercise protocols that differ in durations of exercise. This refers to duration of bouts in minutes, days per week, and total number of weeks. Mind-body exercise programs that appear to benefit sleep had frequencies varying from 3 to 5 times per week with durations of 20 to 25 minutes and 40 to 60 minutes per session (Hosseini, Esfirizi, Marandi, & Rezaie, 2011; Irwin et al., 2014; Li et al., 2004; Taboonpong et al., 2008). Non-mind-body exercise, however, appears to improve sleep when exercise exceeded 45

minutes per session with frequencies of 3 to 5 times per week (Buman, Hekler, Bliwise, et al., 2011; Gebhart et al., 2011; Richards et al., 2011). Other studies ascertained initial improvement of sleep outcomes after one week of exercise (Kredlow et al., 2015; Roveda et al., 2011), while yet other studies carried out exercise interventions lasting for 10 weeks to 12 months (Buman, et al., 2011; Reid et al., 2010; Zong-Yan, Wen-Chyuan Chen, & Huei-Jhen, 2014).

A meta-analysis examining the effect of acute and regular exercise on sleep, range of sleep outcomes, and moderator variables highlights several areas of sleep benefits with regard to exercise duration (Kredlow et al., 2015). First, acute exercise has a moderate beneficial effect on sleep duration, sleep latency, slow wave sleep, and REM sleep, yet these similar effects were not found in regular exercise except for the outcome of sleep latency. Second, the duration of individual exercise bouts in minutes significantly moderated the effect of regular exercise on sleep latency ($B = 0.037$, $SE = 0.02$, $p = .02$), and the total number of weeks moderated the effects on sleep duration ($B = -0.01$, $SE = 0.00$, $p = .04$). Last, time of day in which exercise was performed relative to the bedtime moderated the effect of exercise on sleep. Exercising less than three hours before bedtime decreased wake time after sleep onset, but it did not show significant effects on sleep duration, sleep latency, and sleep efficiency. This evidence fails to support the previous literature review that exercise completed within four hours before bed increased sleep duration (Youngstedt, 2005). Moreover, Flausino et al.'s study (2010) asserted that exercise performed less than three hours before sleep improved sleep efficiency and time spent in REM sleep, as well as decreases time spent in stage 1 sleep and wake time after sleep onset.

Factors that Influence Symptom Experience or Management Strategies

Symptom experiences of sleep disturbances or management strategies may be influenced by many factors, including demographic factors, health and illness, and social connectedness.

Demographic factors.

Age. Scientific and clinical research on sleep consistently finds that sleep disturbances increase with age (Crowley, 2011; Neikrug & Ancoli-Israel, 2010; Rodriguez et al., 2015). Age affects changes in sleep architecture and circadian rhythms as explained in the previous section. As a result, older adults are more likely to experience poor sleep quality, including decreased total sleep time, diminished sleep efficiency, and increased time spent awake at night (Ancoli-Israel, 2005; Gooneratne & Vitiello, 2014; Ohayon et al., 2004; Park, Yoo, & Bae, 2013). This continues as people age further, as noted in a current research study in Chinese older adults that found among people age 60 years old and older, those who were older than 80 years experienced sleep disturbances 1.3 times higher than the 60 to 80 year old group (Kishimoto et al., 2016). This study supported the prevalence of sleep disturbances reported by Thai community-dwelling older adults (Sukyong et al., 2003).

Gender. Robust evidence shows gender differences as potentially associated with sleep disturbances. The prevalence of sleep disturbances is higher in women than men (KyuEun, NamSun, & SongHee, 2015; Mazzotti et al., 2012; Ogunbode et al., 2014). Chong, Zhen-Ying, and Chang-Jun (2005) noted that women's self-reported sleep quality was consistently poorer than that of men in the Chinese sample. This finding is consistent with another cross-sectional study also with Chinese older adults (Su et al., 2004). The

high prevalence of sleep disturbances in women might be due to the positive relationship between female gender and other precipitated factors of sleep disturbances, including poor perceived health status, high stress or depressive symptoms, and high pain intensity (KyuEun et al., 2015; Peltzer, 2012; Su et al., 2004).

Some studies found that gender was associated with sleep-promotion techniques that individuals use to help them with sleep problems. Sok (2008) explored sleep patterns and management strategies of Korean-American older adults and stated that more women than men reported using sleeping aids, prayer, and warm showers to manage their sleep difficulties; however, no differences in using exercise as a sleep-promotion technique were found between men and women (Sok, 2008). This finding does not support another study of rural American older adults that shows no significant difference in use of specific self-care management for sleep disturbances between female and male participants (Sandberg et al., 2014).

Educational status. The higher prevalence of sleep disturbances has also been reported in older adults with lower educational levels (Assantachai, Aekplakorn, Pattara-Archachai, & Porapakkham, 2011; Mazzotti et al., 2012; Su et al., 2004). Tsai, Wong, and Ku (2008) pointed out that low educational level significantly predicted poor sleep quality. In fact, educational attainment may also be associated with one's knowledge of sleep problems, along with an awareness of poor sleep consequences and techniques to promote good sleep (Arber, Bote, & Meadows, 2009). Thus, people with less education may be limited in their abilities to obtain information related sleep problems and management strategies. However, in a study of rural American older adults, educational

level was not significantly associated with self-care techniques that older participants used to promote their sleep (Sandberg et al., 2014).

Marital status. Marriage is a component of social relationship that affects almost every aspect of individual's well-being, including emotional and physical health (Chen, Waite, & Lauderdale, 2015). Evidence shows a significant relationship between sleep disturbances and marital status, particularly for not being married, divorced or widowed (Arber et al., 2009; Krueger & Friedman, 2009; Ogunbode et al., 2014; Tsai et al., 2008). Chen, Waite, and Lauderdale (2015) discovered that older adults with a spouse had longer sleep durations and better sleep quality than those without a spouse. Chen et al. (2015) also explained that better sleep quality among married persons might be the result of reduced exposure to stress and an increased ability to cope with stressful or unexpected situations. In addition to the possible consequence of marital status on coping with stressful situations, being unmarried, divorced, or widowed was significantly associated with comorbidities so that marital status may magnify sleep disturbances through the effect of comorbidities (Arber et al., 2009).

Living status. Sleep disturbances in older adults can be influenced by living status. A cross-sectional study of over 40,000 older adults from eight countries across Africa and Asia demonstrated that the frequency of sleep problems increased with not living with a spouse or a partner (Stranges, Tigbe, Gómez-Olivé, Thorogood, & Kandala, 2012). Likewise, persons who live alone may feel isolated and further sleep poorly (Vaz Fragoso & Gill, 2007).

Health and Illness.

Pain. There is widespread agreement that pain and sleep disturbances are closely related to each other (Neikrug & Ancoli-Israel, 2010). In fact, pain has a significant association with poor sleep (Assantachai et al., 2011; Chen, Hayman, Shmerling, Bean, & Leveille, 2011). In particular, difficulty falling asleep and short sleep duration were reported by older adults who experienced chronic pain (Lunde, Pallesen, Krangnes, & Nordhus, 2010; Peltzer, 2012). Blågestad et al. (2012) also indicated that persons with chronic pain spent a significantly longer time in bed trying to fall asleep, had poorer sleep, and had higher frequency of awakening during the night than those who did not have chronic pain. The degree of sleep disturbance varies according to the levels and sites of pain that individuals experience (Chen et al., 2011). The severity of pain, however, does not only disturb sleep by itself but it also interferes with mood, which then can amplify sleep difficulties (McMillan, Tofthagen, & Morgan, 2008). Not only does pain affect sleep disturbances, but also living with sleep disturbances affects subsequent pain intensity by lowering pain threshold and increasing the pain-signal transmission (Vitiello, Rybarczyk, Korff, & Stepanski, 2009). This indicates that implementing interventions by targeting sleep improvement can also be a benefit to pain reduction (Alsaadi et al., 2014).

Depression. The literature on sleep in older adults indicates the interplay between depression and sleep disturbances. Indeed, depression is a risk for sleep disturbances (Assantachai et al., 2011; Foley et al., 2004; Su et al., 2004). Accordingly, a meta-analysis showed that the presence of depressive symptoms was significantly related to sleep disturbances, including difficulty falling asleep, awakening during the night, and awakening earlier in the morning (Foley et al., 2004). Besides this study, people with a

high level of depressive symptoms had poorer sleep quality, spent longer time falling asleep, and had more frequent nighttime awakenings than those with lower depressive symptoms (Paudel et al., 2008). In addition, Dzierzewski et al. (2015) found that older adults who reported depressive symptoms were 1.25 times more likely to have chronic sleep disturbances than those who did not report depressive symptoms.

Sleep disturbances, in turn, can lead to depression and anxiety. Germain (2013) explains the mechanism by which sleep disturbances, especially for disturbed REM or non-REM sleep, may contribute to maladaptive stress and psychological responses that lead to poor psychological functioning. According to a longitudinal study conducted by Jackson et al. (2014), participants who reported poor sleep quality had higher depressive symptoms and anxiety than those with better sleep quality. This study supports the previous evidence that suggested sleep quality was a predictor of psychological well-being, including positive moods and depressive symptoms (Hanson & Ruthig, 2012).

Comorbid diseases. Evidence shows a high prevalence of sleep disturbance in older adults who reported chronic health problems or comorbid diseases (Li et al., 2013). Foley et al. (2004) conducted an epidemiological study of over 1,000 community-dwelling older adults and found that more than 80% of the sample reported at least one or more chronic health conditions, and around 25% of the sample had at least four conditions. Since chronic health conditions tend to develop as people age, older adults therefore are more likely to report poor sleep quality. In particular, studies in older adults with chronic health conditions found the majority of poor sleepers with arthritis and diabetes reported difficulty falling asleep (Neikrug & Ancoli-Israel, 2010). Other chronic

health conditions related to elder's poor sleep quality include osteoporosis, heart problems, and lung diseases (Ancoli-Israel, 2005).

Social Connectedness. Social connectedness refers to the quality and quantity of social relationships that involve person's interactions with others (Beckett et al., 2002; Toepoel, 2013); it also refers to participation in communities and assistance for family and friend or neighbors (Cornwell & Waite, 2009; Lancee & Radl, 2012). Van Bel, Smolders, IJsselsteijn, and de Kort (2009) conclude that building social connections also requires feelings of belonging and closeness in order that people feel socially connected. In this sense, the relationships and interactions people have with others and their communities can be a resource where people find enjoyment and a sense of belonging and can be a part of groups or communities.

With regard to the definitions, researchers explain that the comprehensive aspects of social connectedness include social networks and social support (Ashida & Heaney, 2008; Cornwell, Laumann, & Schumm, 2008; Thanakwang, 2008). A social network is a web of people who closely interact with each other (Ashida & Heaney, 2008). It can be developed by the process in which people constantly talk and interact with each other (Buckley & McCarthy, 2009). Ties with networks can be classified as kinship (family) and non-kinship (friend) relationships; other aspects are structure and interaction, including the size of social network, perceived support network, and perceived confident network (Lubben et al., 2006). Social support, however, is a part of a give-and-take relationship (Buckley & McCarthy, 2009). Otherwise, social support can be informational, instrumental, and emotional support (Thanakwang, 2008). Social support typically takes place within network systems that are larger, denser, and more

homogeneous in terms of the network members' demographic characteristics (Ashida & Heaney, 2008). Thus, it can imply that people who have a large network size and often interact with others have a higher likelihood of social support, compared with people who have a smaller network size and less interaction with network members.

Research studies on the relationship between social connectedness and sleep quality in older adults have centered on the aspects of family relationship, social support, and social participation. Specifically, a cross-sectional study on the relationship between social network and sleep quality in Taiwanese older adults revealed that sleep quality was likely better in older adults with good relationships with relatives and friends (Yao et al., 2008). Accordingly, Ailshire and Burgard (2012) acknowledged that family relationship can be beneficial for promoting sleep when the relationships are not strained. This study is similar to another study that found the benefits of social support to sleep quality (Costa, Ceolim, & Neri, 2011). In particular, people with lower levels of social support are more likely to experience frequent awakenings during the night and sleep difficulty (Troxel, Buysse, Monk, Begley, & Hall, 2010). In addition to the aspect of family and friends relationships and social support, a recent study by Chen, Lauderdale, and Waite (2016) found that older adults who participated in social activities, especially volunteering work and religious activities, slept better than those who did not. This study underscored the importance of considering social participation in the promotion of sleep quality for older adults.

Social connectedness may benefit sleep quality through many reasons. First, social connectedness may promote sleep quality through the influences of physical health. Researchers postulate the importance of social connectedness as a resource where

older adults can share information and encourage themselves to become active (Galloway, 2013; Singh & Misra, 2009). Subsequently, building a strong social connection can help to maintain health status and promote health-promoting behaviors (Thanakwang & Soonthorndhada, 2011). Second, social connectedness can contribute to good sleep quality through the aspect of psychological well-being, such as maintaining happiness, life satisfaction, and mental health status (Nyqvist et al., 2013). Singh and Misra (2009) have linked a lack of contact with others and communities to increased feelings of depression and loneliness. Given this effect, increased social networks can prevent feelings of loneliness, provide comfort and connection, and increase trust for others and sense of belonging, all of which can contribute sleep quality (Ailshire & Burgard, 2012; Costa et al., 2011). Finally, low social support can negatively impact stress hormone release, which further decreases sleep drive (Wirtz et al., 2006). Thus, since decreased social network is related to low perceived social support, older adults with a small network size and decreased social support are more likely to report sleep difficulty.

Not only does social connectedness affect symptom experience of sleep disturbances or poor sleep quality, but it also influences exercise participation that is beneficial for improving sleep quality. Chaudhury, Campo, Michael, and Mahmood (2016) highlighted the potential role of social connectedness, such as social support and neighborhood relationships, as providing informational and instrumental support and motivation for initiating or maintaining physical activity behaviors. Similarly, support received from friends is acknowledged as a predictor of exercise frequency (Warner, Ziegelmann, Schüz, Wurm, & Schwarzer, 2011). It is possible that older adults may

prioritize support from emotionally meaningful others, such as family members and friends (Chaudhury et al., 2016).

In Thailand, clubs for elders have been established in all sub-districts to provide exercise programs in response to older adults' relatively low physical activity levels (Jitapunkul & Wivatvanit, 2009). Poolsawat (2007) suggested that participation in activities at elder clubs increases physical activity. By engaging in elder club's activities, older adults interact with peers, keep connections with others, and promote social ties. As a result, participation in leisure activities with peers, such as playing games and volunteering, increases social connectedness among older participants (Toepoel, 2013). Hence, older adults who engaged in an exercise session at elder clubs may report higher levels of physical activities, social connectedness, and better sleep quality than those who exercised regularly at home or who did not exercise.

Conclusion

Overall, the symptoms of sleep disturbance experienced by older adults are a complex phenomenon that may differ according to an individual's perception. Older adults often have trouble with sleep initiation, sleep maintenance, an earlier bedtime and wakeup time, and daytime sleepiness. They then subsequently experience the negative impacts of insufficient sleep on their lives. These impacts include poor physical and mental health, poor physical function, falls, and impaired memory. Promoting sleep quality for older adults is needed to further prevent declines in physical, mental, and cognitive functions. Also, physical activity and social connectedness are associated with sleep quality. Thus, older adults who engaged in an elder club exercise session may have

better sleep quality compared to older adults who exercised at home and older adults who did not exercise.

Author's Pilot Study on Sleep Disturbances in Thai Older Adults

Evidence has shown the physical and psychological benefits of physical activity and social connectedness for older adults, especially participation in social activities. Physical activity and social connectedness therefore may benefit the quality of sleep. However, evidence regarding how social connectedness and physical activity relate to sleep quality in Thai older adults is limited. Thus, the researcher conducted the pilot study to test instruments planned and recruitment strategies for the present research study. These data included the frequency of sleep disturbances as measured by the Pittsburg Sleep Quality Index (PSQI), sleep characteristics, the differences in social connectedness and physical activity between older adults with good sleep quality (the PSQI score ≤ 5) and those with poor sleep quality (the PSQI score > 5), and strategies Thai older adults use to promote sleep. In addition, internal consistency (Coefficient Alpha) was computed for reliability testing of research instruments.

Fifty eligible participants were recruited from one elder club in Songkhla Province, Thailand. The inclusion criteria were age 60 or older and elder-club members. Older adults whom the elder club's director indicated were cognitively impaired were excluded from the study. All eligible participants were asked to respond to questionnaires related to sleep quality, physical activity, social connectedness, and factors related to sleep quality (comorbidities, pain, and depressive symptoms). Ten participants from the top five participants with the highest PSQI score (poor sleep quality) and the top five participants with the lowest PSQI score (good sleep quality) were invited to participate in

a focus group interview to explore sleep-promotion techniques. However, on the interviewing date, four participants could not participate, which left six focus-group participants.

The results showed that participants had a mean age of 74.58 ($SD = 8.17$) years and were primarily female (88%), with 44% widowed and 46% living with children. The highest percent of participants reported no comorbid diseases (44%) following by 40 % with one comorbid condition. In addition, no participants reported scores denoting depressive symptoms ($M = 0.86$, $SD = 1.51$). Study instruments and internal consistency values found in the pilot study are shown in Table 2.1.

Table 2.1

Psychometric Characteristics of Study Instruments

| Variables | Measures | Observed range/ M(<i>SD</i>) | Coefficient Alpha (α) |
|----------------------|--|-----------------------------------|-----------------------------------|
| Sleep Quality | The Thai version of Pittsburg | 2 – 13/ | 0.54 |
| | Sleep Quality Index (PSQI) (range 0 – 21) ^a | 4.96 (2.59) | |
| Social Connectedness | Social Connectedness | 10 - 22/ | 0.52 |
| | (relationships with others and participation in community activities) (range 0 – 27) | 15.76 (2.15) | |
| Pain | Thai Geriatric Pain Measure Short-Form (GPM-12) (range 0 – 100) | 0 – 40/ 8.20 (12.89) | 0.77 |
| Depressive Symptoms | Patient Health Questionnaire (PHQ-9) (range 0 – 27) ^b | 0 – 8/ 0.86 (1.51) | 0.52 |
| Physical Activity | The 55 –item Physical Activity Questionnaire (SPAQ) (MET/week) | 53.59 – 479.58/ 151.51 (80.69) | NA |

Note. ^a A cutoff score of the global PSQI > 5 indicates poor sleep quality; ^b A cutoff score of PHQ-9 \geq 9 indicates major depression; MET/week = metabolic equivalence per/ week; M = mean; SD = standard error; NA = non-applicable.

Of the sample, 36 % had poor sleep quality or sleep disturbances, with overall sleep latency of 25 ($SD = 31.10$) minutes, sleep duration of 5.96 ($SD = 1.18$) hours, and sleep efficiency of 85.97 % ($SD = 13.44$). Participants with good sleep quality had a mean sleep latency of 16.56 ($SD = 14.45$) minutes, with sleep duration of 6.41 ($SD = 0.80$) hours, and sleep efficiency of 90.64% ($SD = 7.97$), whereas participants with poor sleep quality reported a mean sleep latency of 40 ($SD 45.11$) minutes, with sleep duration of 5.17 ($SD = 1.34$) hours and sleep efficiency of 77.68 % ($SD = 16.99$). The mean score of physical activity (MET/week) for good sleepers was 160.83 ($SD = 69.30$) and for poor sleepers was 134.93 ($SD = 97.76$). The mean score of social connectedness for good sleepers was 16.12 ($SD = 2.14$) and for poor sleepers was 15.11 ($SD = 2.08$).

The Mann-Whitney U test was used to explore the differences in mean rank scores for the measures of physical activity and social connectedness between good sleepers and poor sleepers. The results revealed that no significant difference was found in social connectedness among good sleepers and poor sleepers ($U = 216, p = 0.13$). However, the difference in physical activity between the two groups approached statistical significance ($U = 191, p = 0.05$). In addition, results from a focus group discussion highlighted common sleep-promotion techniques, including watching TV, maintaining a regular bedtime, and exercising. Participants read books and attended health talks to learn strategies to promote their sleep.

The preliminary data guided the selection of appropriate measurements for the present study. In particular, questionnaires with Coefficient Alpha values lower than 0.7 were not used to measure variables in this study, except for the PSQI. The PSQI is a widespread self-reported sleep tool that can measure both objective sleep quality (sleep

onset latency, sleep duration, and sleep efficiency) and subjective sleep quality (sleep disturbances and consequences). Within its components, the PSQI consists of multiple items measuring factors influencing sleep disturbances (e.g., pain, breathing difficulty, temperature, or snoring). However, these items still do not detect insomnia, which is the most common type of sleep disturbances found in older population. Given these limitations and strengths, the present study included the Insomnia Severity Index (ISI) questionnaire as an additional measure of sleep quality in older adults.

References

- Ailshire, J. A., & Burgard, S. A. (2012). Family relationships and troubled sleep among US adults examining the influences of contact frequency and relationship quality. *Journal of Health and Social Behavior, 53*(2), 248-262. doi: 10.1177/0022146512446642
- Ancoli-Israel, S. (2005). Sleep and aging: prevalence of disturbed sleep and treatment considerations in older adults. *The Journal Of Clinical Psychiatry, 66 Suppl 9*, 24-30. Retrieved from <http://dx.doi.org/10.1097/00019442-200505000-00001>
- Ancoli-Israel, S. (2009). Sleep and its disorders in aging populations [Supplemental material]. *Sleep Medicine, 10*(1), S7-S11. doi: 10.1016/j.sleep.2009.07.004
- Arber, S., Bote, M., & Meadows, R. (2009). Gender and socio-economic patterning of self-reported sleep problems in Britain. *Social Science & Medicine, 68*(2), 281-289. doi: 10.1016/j.socscimed.2008.10.016
- Arora, V. M., Chang, K. L., Fazal, A. Z., Stasiunas, P. G., Meltzer, D. O., Zee, P. C., . . . Van Cauter, E. (2011). Objective sleep duration and quality in hospitalized older adults: Associations with blood pressure and mood. *Journal of the American Geriatrics Society, 59*(11), 2185-2186. doi:10.1111/j.1532-5415.2011.03644.x
- Ashida, S., & Heaney, C. A. (2008). Differential associations of social support and social connectedness with structural features of social networks and the health status of older adults. *Journal of Aging & Health, 20*(7), 872-893 822p. Retrieved from <http://jah.sagepub.com/content/20/7/872.full.pdf>
- Assantachai, P., Aekplakorn, W., Pattara-Archachai, J., & Porapakham, Y. (2011). Factors associated with insomnia in older adults with a mild to moderate degree

of poor cognitive ability in Thailand. *Geriatrics & Gerontology International*, 11(1), 16-23. doi:10.1111/j.1447-0594.2010.00627.x

Baron, K. G., Reid, K. J., & Zee, P. C. (2013). Exercise to improve sleep in insomnia: exploration of the bidirectional effects. *Journal Of Clinical Sleep Medicine: JCSM: Official Publication Of The American Academy Of Sleep Medicine*, 9(8), 819-824. doi:10.5664/jcsm.2930

Beckett, M., Goldman, N., Weinstein, M., Lin, I., & Chuang, Y. (2002). Social environment, life challenge, and health among the elderly in Taiwan. *Social Science & Medicine*, 55(2), 191-209 119p. Retrieved from http://ac.els-cdn.com/S0277953601001617/1-s2.0-S0277953601001617-main.pdf?_tid=7be90832-88d1-11e6-a866-00000aab0f02&acdnat=1475434579_2c8f0bde17ef52b5383e53b5a8af9144

Binhosen, V., Panuthai, S., Srisuphun, W., Chang, E., Sucamvang, K., & Cioffi, J. (2003). Physical activity and health related quality of life among the urban Thai elderly. *Thai Journal of Nursing Research*, 7(4), 231-243. Retrieved from https://www.researchgate.net/profile/Jane_Cioffi/publication/224670414_Physical_activity_and_health_related_quality_of_life_among_the_urban_Thai_elderly/links/0fcfd50500d8637f5a000000.pdf

Blågestad, T., Pallesen, S., Lunde, L. H., Sivertsen, B., Nordhus, I. H., & Grønli, J. (2012). Sleep in older chronic pain patients: a comparative polysomnographic study. *Clinical Journal of Pain*, 28(4), 277-283. doi: 10.1097/AJP.0b013e3182313899

- Bloch, A. H. (2014). *The effect of exercise on self-reported sleep quality in older adults with cognitive complaints*. (74), ProQuest Information & Learning, US. Retrieved from <http://proxy.mul.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2014-99020-148&site=ehost-live>
Available from EBSCOhost psyh database.
- Brown, R. E., Basheer, R., McKenna, J. T., Strecker, R. E., & McCarley, R. W. (2012). Control of sleep and wakefulness. *Physiol Rev*, *92*(3), 1087-1187.
doi:10.1152/physrev.00032.2011
- Buckley, C., & McCarthy, G. (2009). An exploration of social connectedness as perceived by older adults in a long-term care setting in Ireland. *Geriatric Nursing*, *30*(6), 390-396. doi:10.1016/j.gerinurse.2009.09.001
- Buman, M. P., Hekler, E. B., Bliwise, D. L., & King, A. C. (2011). Moderators and mediators of exercise-induced objective sleep improvements in midlife and older adults with sleep complaints. *Health Psychology*, *30*(5), 579-587.
doi:10.1037/a0024293
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193-213. doi:10.1016/0165-1781(89)90047-4
- Carlson, S. A., Fulton, J. E., Schoenborn, C. A., & Loustalot, F. (2010). Trend and prevalence estimates based on the 2008 Physical Activity Guidelines for Americans. *American Journal Of Preventive Medicine*, *39*(4), 305-313.
doi:10.1016/j.amepre.2010.06.006

- Carroll, J. E., Seeman, T. E., Olmstead, R., Melendez, G., Sadakane, R., Bootzin, R., . . . Irwin, M. R. (2015). Improved sleep quality in older adults with insomnia reduces biomarkers of disease risk: Pilot results from a randomized controlled comparative efficacy trial. *Psychoneuroendocrinology*, *55*, 184-192. doi:10.1016/j.psyneuen.2015.02.010
- Centers for Disease Control and Prevention (2011). Effect of short sleep duration on daily activities--United States, 2005-2008. *MMWR. Morbidity and Mortality Weekly Report*, *60*(8), 239-242. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6008a3.htm>
- Chaudhury, H., Campo, M., Michael, Y., & Mahmood, A. (2016). Neighbourhood environment and physical activity in older adults. *Social Science & Medicine*, *149*, 104-113. Retrieved from <http://dx.doi.org/10.1016/j.socscimed.2015.12.011>
- Chen, J.-H., Lauderdale, D. S., & Waite, L. J. (2016). Social participation and older adults' sleep. *Social Science & Medicine*, *149*, 164-173. Retrieved from <http://dx.doi.org/10.1016/j.socscimed.2015.11.045>
- Chen, J.-H., Waite, L. J., Kurina, L. M., Thisted, R. A., McClintock, M., & Lauderdale, D. S. (2015). Insomnia symptoms and actigraph-estimated sleep characteristics in a nationally representative sample of older adults. *The Journals of Gerontology: Series A: Biological Sciences and Medical Sciences*, *70A*(2), 185-192. doi:10.1093/gerona/glu144
- Chen, J.-H., Waite, L. J., & Lauderdale, D. S. (2015). Marriage, relationship quality, and sleep among US older adults. *Journal of Health and Social Behavior*, 1-20. doi: 10.1177/0022146515594631

- Chen, Q., Hayman, L. L., Shmerling, R. H., Bean, J. F., & Leveille, S. G. (2011). Characteristics of chronic pain associated with sleep difficulty in older adults: The maintenance of balance, Independent Living, Intellect, and Zest in the Elderly (MOBILIZE) Boston Study. *Journal of the American Geriatrics Society*, 59(8), 1385-1392. doi:10.1111/j.1532-5415.2011.03544.x
- Chennaoui, M., Arnal, P. J., Sauvet, F., & Léger, D. (2015). Sleep and exercise: A reciprocal issue? *Sleep Medicine Reviews*, 20, 59-72. doi:10.1016/j.smr.2014.06.008
- Chiu-Yueh, Y., & Ai-Fu, C. (2012). Predictors of sleep quality in community-dwelling older adults in Northern Taiwan. *Journal of Nursing Research (Lippincott Williams & Wilkins)*, 20(4), 249-259. doi:10.1097/jnr.0b013e3182736461
- Chong, L., Zhen-Ying, W., & Chang-Jun, Z. (2005). Sleep problem and related factors of elderly in Xinxiang. *Chinese Mental Health Journal*, 19(11), 755-757. Abstract retrieved from <http://proxy.msl.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2005-15454-010&site=ehost-live> smyjsf2fy@xxmc.edu.cn
- Chung, K. F. (2005). Insomnia subtypes and their relationships to daytime sleepiness in patients with obstructive sleep apnea. *Respiration*, 72(5), 460-465. doi: 10.1159/000087668
- Colten, H. R. & Bruce M. A. (2006). *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Institutional of Medicine of the National Academies. Washington, DC: The National Academies Press. Retrieved from <https://docs.wind-watch.org/Sleep-Disorders-Sleep-Deprivation.pdf>

- Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The social connectedness of older adults: A national profile. *American Sociological Review*, 73(2), 185-203. Retrieved from <http://asr.sagepub.com/content/73/2/185.full.pdf>
- Cornwell, E. Y. & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, 50(1), 31-48. Retrieved from <http://hsb.sagepub.com/content/50/1/31.full.pdf>
- Costa, S. V., Ceolim, M. F., & Neri, A. L. (2011). Sleep problems and social support: Frailty in a Brazilian elderly multicenter study. *Revista Latino-Americana de Enfermagem (RLAE)*, 19(4), 920-927. doi:10.1590/S0104-11692011000400010
- Cricco, M., Simonsick, E. M., & Foley, D. J. (2001). The impact of insomnia on cognitive functioning in older adults. *Journal of the American Geriatrics Society*, 49(9), 1185-1189. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1046/j.1532-5415.2001.49235.x/full>
- Crowley, K. (2011). Sleep and sleep disorders in older adults. *Neuropsychology Review*, 21(1), 41-53. doi: 10.1007/s11065-010-9154-6
- Deratnay, P., & Sidani, S. (2013). The effect of insomnia on functional status of community-dwelling older adults. *Journal of Gerontological Nursing*, 39(10), 22-30. doi:10.3928/00989134-20130909-99
- Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J., . . . Taylor, D. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing*, 33(5), 668-676. doi:10.1046/j.1365-2648.2001.01697.x
- Du, S., Dong, J., Zhang, H., Jin, S., Xu, G., Liu, Z., . . . Sun, Z. (2015). Tai chi exercise for self-rated sleep quality in older adults: A systematic review and meta-analysis.

International Journal of Nursing Studies, 52(1), 368-379.

doi:10.1016/j.ijnurstu.2014.05.009

Dzierzewski, J. M., Mitchell, M., Rodriguez, J. C., Fung, C. H., Jouldjian, S., Alessi, C. A., & Martin, J. L. (2015). Patterns and predictors of sleep quality before, during, and after hospitalization in older adults. *Journal Of Clinical Sleep Medicine: JCSM: Official Publication Of The American Academy Of Sleep Medicine*, 11(1), 45-51. doi:10.5664/jcsm.4362

Erlacher, C., Erlacher, D., & Schredl, M. (2015). The effects of exercise on self-rated sleep among adults with chronic sleep complaints. *Journal of Sport and Health Science*, 4(3), 289-298. doi:10.1016/j.jshs.2014.01.001

Espiritu, J. R. D. (2008). Aging-related sleep changes. *Clinics in Geriatric Medicine*, 24(1), 1-14 14p. doi: 10.1016/j.cger.2007.08.007

Fei, S., Norman, I. J., & While, A. E. (2013). Physical activity in older adults: a systematic review. *BMC Public Health*, 13(1), 1-17. doi:10.1186/1471-2458-13-449

Flausino, N. H., Da Silva Prado, J. M., De Queiroz, S. S., Tufik, S., & De Mello, M. T. (2012). Physical exercise performed before bedtime improves the sleep pattern of healthy young good sleepers. *Psychophysiology*, 49(2), 186-192. doi:10.1111/j.1469-8986.2011.01300.x

Foley, D., Ancoli-Israel, S., Britz, P., & Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: Results of the 2003 National Sleep Foundation Sleep in America Survey. *Journal of Psychosomatic Research*, 56(5), 497-502. doi:10.1016/j.jpsychores.2004.02.010

- Galloway, A. P. (2013). *Relationships between social connectedness and spirituality on development of depression and perceived health status in rural populations*. (Ph.D.), University of Northern Colorado. Retrieved from <http://proxy.mul.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,cookie,url,uid&db=cin20&AN=2012566552&site=ehost-live&scope=site> Available from EBSCOhost cin20 database.
- Gebhart, C., Erlacher, D., & Schredl, M. (2011). Moderate exercise plus sleep education improves self-reported sleep quality, daytime mood, and vitality in adults with chronic sleep complaints: a waiting list-controlled trial. *Sleep Disorders, 2011*, 809312-809312. doi:10.1155/2011/809312
- Germain, A. (2013). Sleep disturbances as the hallmark of PTSD: Where are we now? *American Journal of Psychiatr, 2*(4), 403-406. Retrieved from https://www.researchgate.net/profile/Anne_Germain/publication/6280355_Effects_of_a_brief_behavioral_treatment_for_late-life_insomnia_preliminary_findings/links/0912f50de09f9bf358000000.pdf
- Gooneratne, N. S., & Vitiello, M. V. (2014). Sleep in older adults: normative changes, sleep disorders, and treatment options. *Clinics in Geriatric Medicine, 30*(3), 591-627. doi:10.1016/j.cger.2014.04.007
- Gottlieb, D. J., Punjabi, N. M., Newman, A. B., Resnick, H. E., Redline, S., Baldwin, C. M., & Nieto, F. J. (2005). Association of sleep time with diabetes mellitus and impaired glucose tolerance. *Archives of Internal Medicine, 165*(8), 863-868. Retrieved from <http://archinte.jamanetwork.com/article.aspx?articleid=486518&=rssa>

- Haight, T., Tager, I., Sternfeld, B., Satariano, W., & van der Laan, M. (2005). Effects of body composition and leisure-time physical activity on transitions in physical functioning in the elderly. *American Journal of Epidemiology*, *162*(7), 607-617 611p. doi: 10.1093/aje/kwi254
- Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*, *380*(9838), 247-257. Retrieved from [http://dx.doi.org/10.1016/S0140-6736\(12\)60646-1](http://dx.doi.org/10.1016/S0140-6736(12)60646-1)
- Hang, G. A. O., & Jiaojiao, S. H. I. (2013). Effects of aerobic exercise on sleep quality of older adults with sleep disorders. *Journal of Shenyang Institute of Physical Education*, *32*(2), 93-95. Abstract retrieved from <http://epub.cnki.net/grid2008/download.aspx?filename=ZpWeBlVR1g1KstmcBxUZw0UYLF1a2gnVz0UUZRMVqp3Z6xkS5BzRzhGUBZUNrBTVwZ2Q2h0UxBnSwFFeal1Ky1kTuVDOaJvc3Y0Y5R1b5NnVoBTert2MopWSWhHbL1GV4cnMaRFSyoGe3I2b0M0TyNVaZRUSC5mZ&tablename=CJFD2013&dflag=pdfdown>
- Hanson, B. L., & Ruthig, J. C. (2012). The unique role of sleep quality in older adults' psychological well-being. *Journal of Applied Gerontology*, *31*(5), 587-607. doi:10.1177/0733464810392226
- Hara, C., Stewart, R., Lima-Costa, M. F., Rocha, F. L., Fuzikawa, C., Uchoa, E., . . . Castro-Costa, É. (2011). Insomnia subtypes and their relationship to excessive daytime sleepiness in Brazilian community-dwelling older adults. *Sleep: Journal of Sleep and Sleep Disorders Research*, *34*(8), 1111-1117. doi: 10.5665/SLEEP.1172

- Harvey, A. G., Stinson, K., Whitaker, K. L., Moskovitz, D., & Virk, H. (2008). The subjective meaning of sleep quality: A comparison of individuals with and without insomnia. *Sleep: Journal of Sleep and Sleep Disorders Research*, 31(3), 383-393. Retrieved from https://www.researchgate.net/profile/Damian_Moskovitz/publication/5489713_The_subjective_meaning_of_sleep_quality_a_comparison_of_individuals_with_and_without_insomnia/links/02e7e53c61f4564bb0000000.pdf
- Herring, M. P., O'Connor, P. J., & Dishman, R. K. (2010). The effect of exercise training on anxiety symptoms among patients: a systematic review. *Archives of Internal Medicine*, 170(4), 321-331. doi: 10.1001/archinternmed.2009.530
- Hill, E. L., Cumming, R. G., Lewis, R., Carrington, S., & Le Couteur, D. G. (2007). Sleep disturbances and falls in older adults. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, 62A(1), 62-66. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/62/1/62.full.pdf+html>
- Holfeld, B., & Ruthig, J. C. (2014). A Longitudinal examination of sleep quality and physical activity in older adults. *Journal of Applied Gerontology*, 33(7), 791-807. doi:10.1177/0733464812455097
- Hosseini, H., Esfirizi, M. F., Marandi, S. M., & Rezaie, A. (2011). The effect of Tai Chi exercise on the sleep quality of the elderly residents in Isfahan, Sadeghieh elderly home. *Iranian journal of nursing and midwifery research*, 16(1). Retrieved from <http://ijnmr.mui.ac.ir/index.php/ijnmr/article/viewFile/309/266>

- Hui, E. K., & Rubenstein, L. Z. (2006). Promoting physical activity and exercise in older adults. *Journal of the American Medical Directors Association, 7*(5), 310-314
315p. doi: 10.1016/j.jamda.2006.03.006
- Iftikhar, I. H., Donley, M. A., Mindel, J., Pleister, A., Soriano, S., & Magalang, U. J. (2015). Sleep duration and metabolic syndrome. An updated dose-risk metaanalysis. *Annals Of The American Thoracic Society, 12*(9), 1364-1372.
doi:10.1513/AnnalsATS.201504-190OC
- Inoue, S., Yorifuji, T., Sugiyama, M., Ohta, T., Ishikawa-Takata, K., & Doi, H. (2013). Does habitual physical activity prevent insomnia? A cross-sectional and longitudinal study of elderly Japanese. *Journal of Aging & Physical Activity, 21*(2), 119-139. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=S&aualast=Inoue&atitle=Does+habitual+physical+activity+prevent+insomnia%3F+A+cross-sectional+and+longitudinal+study+of+elderly+Japanese&title=Journal+of+aging+and+physical+activity&volume=21&issue=2&date=2013&sp>
- Irwin, M. R., Olmstead, R., Carrillo, C., Sadeghi, N., Breen, E. C., Witarama, T., . . . Nicassio, P. (2014). Cognitive behavioral therapy vs. Tai Chi for late life insomnia and inflammatory risk: A randomized controlled comparative efficacy trial. *Sleep, 37*(9), 1543-1552. doi: 10.5665/sleep.4008
- Irwin, M. R., Olmstead, R., & Motivala, S. J. (2008). Improving sleep quality in older adults with moderate sleep complaints: A randomized controlled trial of Tai Chi Chih. *Sleep: Journal of Sleep and Sleep Disorders Research, 31*(7), 1001-1008.

Retrieved from http://www.tcccommunity.net/uploads/Irwin_SLEEP_TCC_Sleep_Quality__2008.pdf

- Izac, S. M. (2006). Basic anatomy and physiology of sleep. *American Journal of Electroneurodiagnostic Technology*, 46(1), 18-67 24p. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=MSM&aulast=Izac&atitle=Basic+anatomy+and+physiology+of+sleep&id=doi:10.1080/1086508X.2006.11079555&title=American+journal+of+EEG+technology&volume=46&issue=1&date=2006&spage=18&issn=1086-508X>
- Jackson, M. L., Sztendur, E. M., Diamond, N. T., Byles, J. E., & Bruck, D. (2014). Sleep difficulties and the development of depression and anxiety: A longitudinal study of young Australian women. *Archives of Women's Mental Health*, 17(3), 189-198. doi:10.1007/s00737-014-0417-8
- Janyacharoen, T., Laophosri, M., Kanpittaya, J., Auvichayapat, P., & Sawanyawisuth, K. (2013). Physical performance in recently aged adults after 6 weeks traditional Thai dance: a randomized controlled trial. *Clinical interventions in aging*, 8, 855. Retrieved from <http://dx.doi.org/10.2147/CIA.S41076>
- Jarupunt, S., Paokanha, R., Subgranon, R., & Piputvawanicha, N. (2011). The effectiveness of an applied Boonmee long-stick danced exercise program with self-efficacy theory on depression and physical fitness for older adults in nursing home. *The Journal Of Faculty Of Nursing Burapha University*, 19(1), 42-56. Retrieved from http://file:///E:/Dissertation_Chontra/Lituration%20Review/Thai%20Journal_Elder%20Adults/Thai%20Exercise/Thai%20wand%20exercise.pdf

- Jirong, Y., Changquan, H., Hongmei, W., & Bi-Rong, D. (2013). Association of sleep quality and dementia among long-lived Chinese older adults. *Age (Dordrecht, Netherlands)*, 35(4), 1423-1432. doi:10.1007/s11357-012-9432-8
- Jitapunkul, S., & Wivatvanit, S. (2009). National policies and programs for the aging population in Thailand. *Ageing International*, 33(1-4), 62-74.
doi:10.1007/s12126-009-9027-6
- Kanhachon, W., Boonprakob, Y., Wanpen, S., & Boontha, K. (2014). Comparative effect of Paslop dancing and specific core stabilizing exercise on postural control and core strength in sedentary subjects. *Bulletin of Chiang Mai Associated Medical Sciences*, 47(3), 143. Retrieved from file:///C:/Users/cp98f/Downloads/197-400-1-SM.pdf
- Kawamoto, R., & Doi, T. (2002). Sleep problems as a risk factor for fall in community-dwelling older adults. *Geriatrics & Gerontology International*, 2(1), 16-22.
doi:10.1046/j.1444-1586.2002.00017.x
- Kennedy, A. B., & Resnick, P. B. (2015). Mindfulness and physical activity. *American Journal of Lifestyle Medicine*, 9(3), 221-223. doi: 10.1177/1559827614564546
- Khamrani, A. A. A., Shams, A., Dehkordi, P. S., & Mohajeri, R. (2014). The effect of low and moderate intensity aerobic exercises on sleep quality in elderly adult males. *Pakistan Journal Of Medical Sciences*, 30(2), 417-421.
doi:10.12669/pjms.302.4386

- Khullar, A. (2012). The role of melatonin in the circadian rhythm sleep-wake cycle: a review of endogenous and exogenous melatonin. *Psychiatric Times*, 29(7), 26-26. Abstract retrieved from <http://www.psychiatrictimes.com>
- King, A. C., Oman, R. F., Brassington, G. S., Bilwise, D. L., & Haskell, W. L. (1997). Moderate-intensity exercise and self-rated quality of sleep in older adults: a randomized controlled trial. *JAMA: Journal of the American Medical Association*, 277(1), 32-37. doi: 10.1001/jama.1997.03540250040029.
- King, A. C., Pruitt, L. A., Woo, S., Castro, C. M., Ahn, D. K., Vitiello, M. V., . . . Bliwise, D. L. (2008). Effects of moderate-intensity exercise on polysomnographic and subjective sleep quality in older adults with mild to moderate sleep complaints. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, 63A(9), 997-1004. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/63/9/997.full.pdf+html>
- Kishimoto, Y., Okamoto, N., Saeki, K., Tomioka, K., Obayashi, K., Komatsu, M., & Kurumatani, N. (2016). Bodily pain, social support, depression symptoms and stroke history are independently associated with sleep disturbance among the elderly: a cross-sectional analysis of the Fujiwara-kyo study. *Environmental Health and Preventive Medicine*, 1-9. doi: 10.1007/s12199-016-0529-z
- Kraithaworn, P., Sirapo-ngam, Y., Piaseu, N., Nityasuddhi, D., & Gretebeck, K. A. (2011). Factors Predicting Physical Activity among Older Thais Living in Low Socioeconomic Urban Communities. *Pacific Rim International Journal of Nursing Research*, 15(1). Retrieved from <http://file:///C:/Users/cp98f/Downloads/6539-12690-1-SM.pdf>

- Kredlow, M., Capozzoli, M., Hearon, B., Calkins, A., & Otto, M. (2015). The effects of physical activity on sleep: a meta-analytic review. *Journal of Behavioral Medicine*, 38(3), 427-449. doi:10.1007/s10865-015-9617-6
- Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep Medicine*, 9(Suppl1), S10-S17. doi:10.1016/S1389-9457(08)70011-X
- KyuEun, L., NamSun, K., & SongHee, H. (2015). Gender difference in factors affecting quality of sleep among community dwelling elders. *International Journal of Bio-Science & Bio-Technology*, 7(1), 179-183. doi:10.14257/ijbsbt.2015.7.1.18
- Lambiase, M. J., Gabriel, K. P., Kuller, L. H., & Matthews, K. A. (2013). Temporal relationships between physical activity and sleep in older women. *Medicine & Science in Sports & Exercise*, 45(12), 2362-2368. doi:10.1249/MSS.0b013e31829e4cea
- Lancee, B., & Radl, J. (2012). Social connectedness and the transition from work to retirement. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, doi:10.1093/geronb/gbs049
- Lee, Y.-T., Tsai, C.-F., Ouyang, W.-C., Yang, A. C., Yang, C.-H., & Hwang, J.-P. (2013). Daytime sleepiness: A risk factor for poor social engagement among the elderly. *Psychogeriatrics: The Official Journal Of The Japanese Psychogeriatric Society*, 13(4), 213-220. doi:10.1111/psyg.12020
- Li, Fisher, K. J., Harmer, P., Irbe, D., Tearse, R. G., & Weimer, C. (2004). Tai chi and self-rated quality of sleep and daytime sleepiness in older adults: a randomized controlled trial. *Journal of the American Geriatrics Society*, 52(6), 892-900. doi:10.1111/j.1532-5415.2004.52255.x

- Li, J., Yao, Y.S., Dong, Q., Dong, Y. H., Liu, J. J., Yang, L. S., & Huang, F. (2013). Characterization and factors associated with sleep quality among rural elderly in China. *Arch Gerontol Geriatr*, 56(1), 237-243. doi:10.1016/j.archger.2012.08.002
- Liu, X., & Liu, L. (2005). Sleep habits and insomnia in a sample of elderly persons in China. *Sleep-New York Then Westchester*, 28(12), 1579. Retrieved from <http://www.journalsleep.org/Articles/281215.pdf>
- Liu, X., Uchiyama, M., Kim, K., Okawa, M., Shibui, K., Kudo, Y., . . . Ogihara, R. (2000). Sleep loss and daytime sleepiness in the general adult population of Japan. *Psychiatry Research*, 93(1), 1-11. doi:10.1016/S0165-1781(99)00119-5
- Lo, C. M.-H., & Lee, P. H. (2014). Feasibility and effects of Tai Chi for the promotion of sleep quality and quality of life. *Journal of Gerontological Nursing*, 40(3), 46-52. doi:10.3928/00989134-20131028-08
- Lubben, J., Blozik, E., Gillmann, G., Iliffe, S., von Renteln Kruse, W., Beck, J. C., & Stuck, A. E. (2006). Performance of an abbreviated version of the Lubben Social Network Scale among three European community-dwelling older adult populations. *Gerontologist*, 46(4), 503-513. doi 10.1093/geront/46.4.503
- Lunde, L.-H., Pallesen, S., Krangnes, L., & Nordhus, I. H. (2010). Characteristics of sleep in older adults with chronic pain: a study based on actigraphy and self-reporting. *The Clinical Journal Of Pain*, 26(2), 132-137. doi:10.1097/AJP.0b013e3181b61923
- Mazzotti, D. R., Guindalini, C., Sosa, A. L., Ferri, C. P., & Tufik, S. (2012). Prevalence and correlates for sleep complaints in older adults in low and middle income

- countries: A 10/66 Dementia Research Group study. *Sleep Medicine*, 13(6), 697-702. doi:10.1016/j.sleep.2012.02.009
- McMillan, S. C., Tofthagen, C., & Morgan, M. A. (2008). Relationships among pain, sleep disturbances, and depressive symptoms in outpatients from a comprehensive cancer center. *Journal of Oncology Nursing Forum*, 35(4), 603 - 611. doi:10.1188/08.ONF.603-611
- Mesas, A. E., López-García, E., & Rodríguez-Artalejo, F. (2011). Self-reported sleep duration and falls in older adults. *Journal Of Sleep Research*, 20(1 part I), 21-27. doi:10.1111/j.1365-2869.2010.00867.x
- Millman, R. P. (2012). Sleep and aging. *Medicine & Health Rhode Island*, 95(3), 89 - 90. Retrieved from <http://www.rimed.org/medhealthri/2012-03/2012-03-88.pdf>
- Miyata, S., Noda, A., Iwamoto, K., Kawano, N., Okuda, M., & Ozaki, N. (2013). Poor sleep quality impairs cognitive performance in older adults. *Journal Of Sleep Research*, 22(5), 535-541. doi:10.1111/jsr.12054
- Münch, M., Knoblauch, V., Blatter, K., Schröder, C., Schnitzler, C., Kräuchi, K., . . . Cajochen, C. (2005). Age-related attenuation of the evening circadian arousal signal in humans. *Neurobiology of Aging*, 26(9), 1307-1319. doi:10.1016/j.neurobiolaging.2005.03.004
- Nagel, C. L., Markie, M. B., Richards, K. C., & Taylor, J. L. (2003). Sleep promotion in hospitalized elders. *MEDSURG Nursing*, 12(5), 279-290. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&aunit=CL&auplast=Nagel&atitle=Sleep+promotion+in+hospitalized+elders&title=Medsurg+nursing&volume=12&issue=5&date=2003&spage=279&issn=1092-0811>

- National Sleep Foundation. (2006). *Mechanisms controlling sleep and wakefulness Sleep-wake cycle: Its physiology and impact on health*. Washington, DC: National Sleep Foundation. Retrieved from www.sleepfoundation.org
- Neikrug, A. B., & Ancoli-Israel, S. (2010). Sleep disorders in the older adult—A mini-review. *Gerontology, 56*(2), 181-189. doi: 10.1159/000236900
- Ogunbode, A. M., Adebusoye, L. A., Olowookere, O. O., Owolabi, M., & Ogunniyi, A. (2014). Factors associated with insomnia among elderly patients attending a geriatric centre in Nigeria. *Current Gerontology & Geriatrics Research, 1*-10. doi:10.1155/2014/780535
- Ohayon, M. M. (2008). From wakefulness to excessive sleepiness: What we know and still need to know. *Sleep medicine reviews, 12*(2), 129-141. doi:10.1016/j.smrv.2008.01.001
- Ohayon, M. M., Carskadon, M. A., Guilleminault, C., & Vitiello, M. V. (2004). Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: Developing normative sleep values across the human lifespan. *Sleep: Journal of Sleep and Sleep Disorders Research, 27*(7), 1255-1273. Retrieved from https://www.researchgate.net/profile/Michael_Vitiello/publication/8140802_Meta-analysis_of_quantitative_sleep_parameters_from_childhood_to_old_age_in_healthy_individuals_Developing_normative_sleep_values_across_the_human_lifespan_Sleep_27_1255-1274/links/02bfe51226d35f28b1000000.pdf
- Pa, J., Goodson, W., Bloch, A., King, A. C., Yaffe, K., & Barnes, D. E. (2014). Effect of exercise and cognitive activity on self-reported sleep quality in community-dwelling older adults with cognitive complaints: A randomized controlled trial.

Journal of the American Geriatrics Society, 62(12), 2319-2326. doi:10.1111/jgs.13158

- Park, J.-H., Yoo, M.-S., & Bae, S. H. (2013). Prevalence and predictors of poor sleep quality in Korean older adults. *International Journal of Nursing Practice*, 19(2), 116-123. doi:10.1111/ijn.12047
- Passos, G. S., Poyares, D. L. R., Santana, M. G., Tufik, S., & Mello, M. T. d. (2012). Is exercise an alternative treatment for chronic insomnia? *Clinics (São Paulo, Brazil)*, 67(6), 653-660. doi: 10.6061/clinics/2012(06)17
- Paudel, M. L., Taylor, B. C., Diem, S. J., Stone, K. L., Ancoli-Israel, S., Redline, S., & Ensrud, K. E. (2008). Association between depressive symptoms and sleep disturbances in community-dwelling older men. *Journal of the American Geriatrics Society*, 56(7), 1228-1235. doi:10.1111/j.1532-5415.2008.01753.x
- Peltzer, K. (2012). Sociodemographic and health correlates of sleep problems and duration in older adults in South Africa. *South African Journal of Psychiatry*, 18(4), 150-156. doi:10.7196/SAJP.369
- Peungsuwan, P., Sermcheep, P., Harnmontree, P., Eungpinichpong, W., Puntumetakul, R., Chatchawan, U., & Yamauchi, J. (2014). The effectiveness of Thai exercise with traditional massage on the pain, walking ability and QOL of older adults with knee osteoarthritis: A randomized controlled trial in the community. *Journal of Physical Therapy Science*, 26(1), 139-144. doi:10.1589/jpts.26.139
- Pilcher, J. J., Schoeling, S. E., & Prosansky, C. M. (2000). Self-report sleep habits as predictors of subjective sleepiness. *Behavioral Medicine (Washington, D.C.)*, 25(4), 161-168. Retrieved from <http://web.b.ebscohost.com/ehost/detail/detail?>

vid=11&sid=0de9c427-aed6-4da4-8f3e-c3d5e35de253%40sessionmgr1&bdata
=JkF1dGhUeXBIPWlwLGNvb2tp ZSx1cmwsdWlkJnNpdGU9ZWwhvc3Qtb
GI2ZSZzY29wZT1zaXRl#AN=2000-07652-003&db=psyh

- Poolsawat, W. (2007). *Physical activity of the older adults in Bangkok* (Doctoral dissertation, Mahidol University). Retrieved from https://www.researchgate.net/publication/238755622_
- Putilov, A. A., Munch, M. Y., & Cajochen, C. (2013). Principal component structuring of the non-REM Sleep EEG spectrum in older adults yields age-related changes in the sleep and wake drives. *Curr Aging Sci*, 6(3), 280-293. Retrieved from <http://dx.doi.org/10.1016/j.physbeh.2014.05.027>
- Reid, K. J., Baron, K. G., Lu, B., Naylor, E., Wolfe, L., & Zee, P. C. (2010). Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. *Sleep Medicine*, 11(9), 934-940. doi:10.1016/j.sleep.2010.04.014
- Richards, K. C., Lambert, C., Beck, C. K., Bliwise, D. L., Evans, W. J., Kalra, G. K., . . . Sullivan, D. H. (2011). Strength training, walking, and social activity improve sleep in nursing home and assisted living residents: A randomized controlled trial. *Journal of the American Geriatrics Society*, 59(2), 214-223. doi: 10.1111/j.1532-5415.2010.03246.x
- Rodriguez, J. C., Dzierzewski, J. M., & Alessi, C. A. (2015). Sleep problems in the elderly. *Medical Clinics of North America*, 99(2), 431-439. doi:10.1016/j.mcna.2014.11.013
- Roveda, E., Sciolla, C., Montaruli, A., Calogiuri, G., Angeli, A., & Carandente, F. (2011). Effects of endurance and strength acute exercise on night sleep quality.

- International SportMed Journal*, 12(3), 113-124. Retrieved from https://www.researchgate.net/profile/Giovanna_Calogiuri/publication/235428933_Effects_of_endurance_and_strength_acute_exercise_on_night_sleep_quality/links/5665ccb808ae15e74634bd92.pdf
- Saccomano, S. J. (2014). Sleep Disorders in Older Adults. *Journal of Gerontological Nursing*, 40(3), 38-45. doi:10.3928/00989134-20131029-06
- Sampaio, R. A. C., Sewo Sampaio, P. Y., Yamada, M., Tsuboyama, T., & Arai, H. (2014). Self-reported quality of sleep is associated with bodily pain, vitality and cognitive impairment in Japanese older adults. *Geriatrics & Gerontology International*, 14(3), 628-635. doi:10.1111/ggi.12149
- Sandberg, J. C., Suerken, C. K., Quandt, S. A., Altizer, K. P., Bell, R. A., Lang, W., . . . Arcury, T. A. (2014). Self-reported sleep difficulties and self-care strategies among rural older adults. *Journal Of Evidence-Based Complementary & Alternative Medicine*, 19(1), 36-42. doi:10.1177/2156587213510005
- Sateia, M. J. (2014). International classification of sleep disorders-third edition: highlights and modifications. *CHEST*, 146(5), 1387-1394. doi:10.1378/chest.14-0970
- Sexton, C. E., Storsve, A. B., Walhovd, K. B., Johansen-Berg, H., & Fjell, A. M. (2014). Poor sleep quality is associated with increased cortical atrophy in community-dwelling adults. *Neurology*, 83(11), 967-973. doi:10.1212/WNL.0000000000000774
- Shams, A., Kamrani, A. A. A., Dehkordi, P. S., & Mohajeri, R. (2013). Moderate-intensity aerobic exercise improves sleep quality in men older adults. *Medicinski*

- Glasnik / Medical Gazette*, 18(50), 9-17. Retrieved from <http://scindeks-clanci.ceon.rs/data/pdf/1452-0923/2013/1452-09231350009S.pdf>
- Shizheng, D., Jianshu, D., Heng, Z., Shengji, J., Guihua, X., Zengxia, L., . . . Zhiling, S. (2015). Tai chi exercise for self-rated sleep quality in older adults: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 52(1), 368-379. doi:10.1016/j.ijnurstu.2014.05.009
- Singh, A., & Misra, N. (2009). Loneliness, depression and sociability in old age. *Industrial Psychiatry Journal*, 18(1), 51-55. doi:10.4103/0972-6748.57861
- Skelly, A. H., Leeman, J., Carlson, J., Soward, A. C. M., & Burns, D. (2008). Conceptual model of symptom-focused diabetes care for African Americans. *Journal of Nursing Scholarship*, 40(3), 261-267 267p. doi:10.1111/j.1547-5069.2008.00236.x
- Sok, S. R. (2008). Sleep patterns and insomnia management in Korean-American older adult immigrants. *Journal of Clinical Nursing*, 17(1), 135-143. doi:10.1111/j.1365-2702.2006.01869.x
- Strand, L. B., Carnethon, M., Biggs, M. L., Djoussé, L., Kaplan, R. C., Siscovick, D. S., ... & Mukamal, K. J. (2015). Sleep disturbances and glucose metabolism in older adults: the Cardiovascular Health Study. *Diabetes care*, 38(11), 2050-2058. doi:10.2337/dc15-0137
- Stranges, S., Tigbe, W., Gómez-Olivé, F. X., Thorogood, M., & Kandala, N.-B. (2012). Sleep problems: an emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across

- Africa and Asia. *Sleep*, 35(8), 1173-1181. Retrieved from <http://dx.doi.org/10.5665/sleep.2012>
- Su, T.-P., Huang, S.-R., & Chou, P. (2004). Prevalence and risk factors of insomnia in community-dwelling Chinese elderly: a Taiwanese urban area survey. *The Australian And New Zealand Journal Of Psychiatry*, 38(9), 706-713. doi:10.1080/j.1440-1614.2004.01444.x
- Sukyng, C., Bhokakul, V., & Udomsubpayakul, U. (2003). An epidemiological study on insomnia in an elderly Thai population. *Journal of the Medical Association of Thailand = Chotmai het thangphaet*, 86(4), 316-324.
- Taboonpong, S., Puthsri, N., Kong-In, W., & Saejew, A. (2008). The effects of Tai Chi on sleep quality, well-being and physical performances among older adults. *Thai Journal of Nursing Research*, 12(1), 1-13. Retrieved from <http://www.tci-thaijo.org/index.php/PRIJNR/article/view/5887/5092>
- Tantiphongwiwat, W. & Kong-In, W. (2012). *Effect of norabic exercise on blood pressure and physical fitness among elders with hypertension* (Unpublished master's thesis). Prince of Songkla University, Thailand.
- Thanakwang, K. (2008). Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Thai Journal of Nursing Research*, 12(4), 243-258. Retrieved from http://www.tnc.or.th/files/2011/05/tnc_journal-631/thai_journal_of_nursing_research_vol_12_no_4_oct_33974.pdf.
- Thanakwang, K., & Soonthorndhada, K. (2011). Mechanisms by which social support networks influence healthy aging among Thai community-dwelling elderly. *Journal of Aging & Health*, 23(8), 1352-1378. doi:10.1177/0898264311418503

- Toepoel, V. (2013). Ageing, leisure, and social connectedness: How could leisure help reduce isolation of older adults? *Social Indicators Research*, *113*(1), 355-372. doi:10.1007/s11205-012-0097-6
- Troxel, W. M., Buysse, D. J., Monk, T. H., Begley, A., & Hall, M. (2010). Does social support differentially affect sleep in older adults with versus without insomnia? *Journal of Psychosomatic Research*, *69*(5), 459-466. doi: 10.1016/j.jpsychores.2010.04.003
- Tsai, Y., Wong, T. K. S., & Ku, Y. (2008). Self-care management of sleep disturbances and risk factors for poor sleep among older residents of Taiwanese nursing homes. *Journal of Clinical Nursing*, *17*(9), 1219-1226. doi:10.1111/j.1365-2702.2007.02020.x
- Uchida, S., Shioda, K., Morita, Y., Kubota, C., Ganeko, M., & Takeda, N. (2012). Exercise effects on sleep physiology. *Frontiers In Neurology*, *3*, 48-48. doi:10.3389/fneur.2012.00048
- Van Bel, D. T., Smolders, K., IJsselsteijn, W. A., & de Kort, Y. (2009). Social connectedness: concept and measurement. *Intelligent Environments*, *2*, 67-74.
- Van Cauter, E., Leproult, R., & Plat, L. (2000). Age-related changes in slow wave sleep and REM sleep and relationship with growth hormone and cortisol levels in healthy men. *JAMA: Journal of the American Medical Association*, *284*(7), 861-868. doi: 10.3233/978-1-60750-034-6-67
- Vaz Fragoso, C. A., & Gill, T. M. (2007). Sleep complaints in community-living older adults: a multifactorial geriatric syndrome. *Journal of the American Geriatrics Society*, *55*(11), 1853-1866. doi:10.1111/j.1532-5415.2007.01399.x

- Vitiello, M. V., Rybarczyk, B., Von Korff, M., & Stepanski, E. J. (2009). Cognitive behavioral therapy for insomnia improves sleep and decreases pain in older adults with co-morbid insomnia and osteoarthritis. *Journal of Clinical Sleep Medicine*, 5(4), 355-362. doi: 10.1111/jgs.12275
- Wang, X., & Youngstedt, S. D. (2014). Sleep quality improved following a single session of moderate-intensity aerobic exercise in older women: Results from a pilot study. *Journal of Sport and Health Science*, 3(4), 338-342. doi:10.1016/j.jshs.2013.11.004
- Warner, L., Ziegelmann, J., Schüz, B., Wurm, S., & Schwarzer, R. (2011). Synergistic effect of social support and self-efficacy on physical exercise in older adults. *Journal of Aging & Physical Activity*, 19(3), 249-261 213p. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=LM&aulast=Warner&atitle=Synergistic+effect+of+social+support+and+self-efficacy+on+physical+exercise+in+older+adults&title=Journal+of+aging+and+physical+activity&volume=19&issue=3&date=2011&spage=249&issn=1063-8652>
- Wichitsranoi, J., Pilarit, J., Klomkamonl, W., Ploynamngern, N., & Wongsathikun, J. (2011). Effects of Thai wand exercise on lung capacity in sedentary young adults. *Journal of Pharmaceutical and BioSciences*, 24(1), 64-69. Retrieved from <https://www.researchgate.net/publication/281088439>
- Wirtz, P. H., von Känel, R., Mohiyeddini, C., Emini, L., Ruedisueli, K., Groessbauer, S., & Ehlert, U. (2006). Low social support and poor emotional regulation are associated with increased stress hormone reactivity to mental stress in systemic

- hypertension. *The Journal of Clinical Endocrinology & Metabolism*, 91(10), 3857-3865. doi: 10.1210/jc.2005-2586
- Wolkove, Elkholy, Baltzan, & Palayew. (2007). Sleep and aging: 1. Sleep disorders commonly found in older adults. *CMAJ: Canadian Medical Association Journal Supplement*, 176(9), 1299-1304. doi:10.1503/cmaj.060792
- Wu, C. Y., Su, T. P., Fang, C. L., & Yeh Chang, M. (2012). Sleep quality among community-dwelling elderly people and its demographic, mental, and physical correlates. *J Chin Med Assoc*, 75(2), 75-80. doi:10.1016/j.jcma.2011.12.011
- Yang, P.-Y., Ho, K.-H., Chen, H.-C., & Chien, M.-Y. (2012). Exercise training improves sleep quality in middle-aged and older adults with sleep problems: a systematic review. *Journal of Physiotherapy (Elsevier)*, 58(3), 157-163. doi:10.1016/S1836-9553(12)70106-6
- Yao, K., Yu, S., Cheng, S., & Chen, I. (2008). Relationships between personal, depression and social network factors and sleep quality in community-dwelling older adults. *Journal of Nursing Research (Taiwan Nurses Association)*, 16(2), 131-138. doi: 10.1097/01.JNR.0000387298.37419.ff
- Youngstedt, S. D. (2005). Effects of exercise on sleep. *Clinics in sports medicine*, 24(2), 355-365.
- Zisapel, N. (2001). Circadian rhythm sleep disorders: pathophysiology and potential approaches to management. *CNS Drugs*, 15(4), 311-328. Abstract retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/11463135>
- Zong-Yan, C., Wen-Chyuan Chen, K., & Huei-Jhen, W. (2014). Effects of a group-based step aerobics training on sleep quality and melatonin levels in sleep-impaired

postmenopausal women. *Journal of Strength & Conditioning Research*
(Lippincott Williams & Wilkins), 28(9), 2597-2603.

doi:10.1519/JSC.0000000000000428

Chapter Three

Methods

This chapter describes the design and the methods utilized in the study. The contents include sample, setting, data collection, data management, and analysis. Human subjects' protection is also addressed.

Research Design

The study used a cross-sectional correlational design to compare sleep quality for older adults who participate in an elder club exercise program with older adults who perform exercise at home and those who do not exercise regularly in order to examine the associations between studied variables and sleep quality and to explore factors predicting sleep quality in Thai older adults. The cross-sectional correlational study is an appropriate design to explain the incidence of the outcomes of interest and the association between independent and dependent variables that sometimes are difficult to directly manipulate (Levin, 2006). In the current study, demographic variables, health conditions, pain, and depressive symptoms cannot be manipulated to explain the relationships with sleep quality in older adults. In addition, the cross-sectional correlational design is a pertinent method to compare the outcome of interest across levels of the attribute independent variable, which in this study, it is exercise participation. Although the findings gained from a cross-sectional study cannot be attributed to causal effects on sleep quality in Thai older adults since data were collected at one specific point of time, these findings, however, will highlight factors related to sleep quality, such as demographic variables, pain, depression, health conditions, social connectedness, and physical activity. Therefore, the findings gained through this study would benefit

healthcare providers and stakeholders, such as family members and policymakers, to use as a guide to tailor programs or improve support systems for sleep promotion in Thai communities.

Sample and Sample Size

Sample. Participants were Thai home-dwelling older adults. They were divided into three groups: (a) elder club exercise, (b) home exercise, and (c) non-regular exercise. First, the elder club exercise refers to the group of older adults who were, at the time of the study, participating in elder club exercise programs at least twice a week; it was unknown if they did additional exercise sessions at home. The home exercise group refers to the older adults who were performing an exercise program at home or other places but not elder clubs (e.g., public park and stadium) and met the minimum level of recommendation by the 2008 Physical Activity Guideline for Americans (Carlson et al., 2010). Finally, the non-regular exercise refers to the group of older adults who might perform an exercise program at home but did not meet the minimum level of recommendation by the 2008 Physical Activity Guideline for Americans or who did not perform an exercise program at home.

Sample Size. Sample size calculation was based on data from a previous study that compared sleep quality for participants with high physical activity levels and those with low physical activity levels (Wu et al., 2012). This study provided the effect size of $r = -.27$. Based on using a one-way ANOVA method with two-sided alternative, the alpha value of .05, and statistical power of 0.8, assuming equal groups, the estimated sample size for the three group comparisons is 52 to 60 per group (Cohen, 1988). Because the sample size calculation was based on the effect size derived from the

correlation between sleep quality and physical activity levels and because the current study included other analyses for which the effect size might be smaller, 60 subjects per group for a total of 180 were recruited to maximize power to detect significant relationships on other studied variables.

Setting

Participants were recruited from Hat Yai District, Songkhla Province, Thailand. Hat Yai District is the largest city and the business center of Songkhla Province and Southern Thailand. The principal investigator recruited eligible and willing older adults who attended elder club exercise sessions from four elder centers where the exercise programs were active. The four elder clubs included (a) Faculty of Nursing Prince of Songkla University, (b) Hat Yai Municipal, (c) Ban Proo Elder Club, and (d) Num Noi Elder Club. The details of average number of attendees, types and frequency of exercise programs for each elder club are presented in Table 3.1.

Older participants who performed an exercise program at home and those who did not regularly exercise were recruited from three health promotion hospitals where the four elder clubs were located, including (a) the Thumbon Kor Hong health promotion hospital, (b) the Thumbon Ban Proo health promotion hospital, and (c) the Thumbon Num Noi health promotion hospital. A health promotion hospital is a healthcare center established in all subdistricts to serve people in those areas. Healthcare services are focused on primary health care and health promotion, and they include outpatient clinics, home visits, and health promotion instruction.

Table 3.1

Average Number of Exercise Attendees, Types, and Frequency of Exercise Programs for Each Elder Club

| Research Site | Average Number of Attendees | Exercise | |
|---------------------|--------------------------------|---|-----------------------|
| | | Types | Frequency Day/week |
| Faculty of Nursing | 60 | Tai Chi Fan Dance | 3 |
| Hat Yai Municipal | 40 | Tai Chi Norabic exercise Thai wand exercise | 5 |
| Ban Proo Elder Club | 30 | Tai Chi Bar Slope Dance | 7 |
| Num Noi Elder Club | 30 | Tai Chi Bar Slope Dance | 5 |
| Total | | 120 | |

Recruitment and Screening

The principal investigator recruited participants after study approval by the University of Missouri Health Sciences Institutional Review Board (IRB) and the Institutional Review Board for all elder clubs and health promotion hospitals (see Appendix A). Convenience sampling was used to recruit participants into the study. The participant recruitment process consisted of several steps. First, the principal investigator sent the introduction letter to the director of each elder club and health promotion hospital to describe the project and inform them that he or she would receive a phone call from the principal investigator to discuss the study. The introduction letter explained the purposes and design of the study (see Appendix B), the screening of participants, and data collection. All directors of the elder clubs and the district health promotion hospitals

were asked for help in advertising the project and listing the name of willing participants, their contact numbers, and permission to meet with the principal investigator. The directors helped the principal investigator to identify cognitively intact older adults for the study.

Second, the flyers and advertisements (see Appendix C) were distributed to four elder clubs for invitation of older adults who attended exercise programs at elder clubs and to three district health promotion hospitals for older adults who performed and did not perform an exercise program at home. The flyers instructed interested people to contact the directors named in the flyers and provide contact information to be shared with the principal investigator. Third, the principal investigator scheduled a meeting with all people who provided contact information for eligibility screening. After this, all eligible people were asked to provide informed consent (see Appendix D).

Inclusion Criteria

The inclusion criteria applied to all groups of participants were (a) age 60 or older, (b) willingness to participate in the study, and (c) ability to give verbal informed consent. Older adults who currently perform an exercise session at elder clubs for 60 – 90 minutes per session, at least twice a week over the past three months were recruited into the elder club exercise group, using the reference from previous evidence that exercise programs shown to improve sleep quality have been of 10 to 16 weeks duration (Yang, et al., 2012). Older adults at elder clubs who participated in the investigator's pilot study as described in Chapter 2 were excluded from this study.

To recruit participants in the home exercise group and in the non-regular exercise group, the principal investigator applied the 2008 Physical Activity Guideline for

Americans to identify the levels of activities (Carlson et al., 2010). Older adults who did not participate in an exercise program at elder clubs were asked two series of questions. These questions included, “How often, during leisure time over the past week, you participated for at least 10 minutes at a time in (a) vigorous-intensity activities that cause heavy sweating or large increases in breathing or heart rate and (b) light- or moderate-intensity activities that cause light sweating or slight or moderate increases in breathing or heart rate?” and “How many minutes did you participate in each type of activity?” The responses to those questions were frequency of participation per week and duration of each session (minutes). The minutes of vigorous-intensity activities were given twice the credit of moderate-intensity activity when combining moderate and vigorous intensity to calculate the equivalent combination. Older adults who reported activities that met the active criteria (≥ 150 minutes/ week of light- or moderate-intensity activity or ≥ 75 minutes/week of vigorous-intensity activity or an equivalence of two) were recruited into the home exercise group. However, those who reported some activities but not enough to meet the active criteria were recruited into the non-regular exercise group.

Exclusion Criteria

The principal investigator asked all interested older participants if they had any conditions that limited exercise participation or affected sleep before signing the consent form. Persons who reported any of the following conditions were excluded from the study.

1. Primary sleep disorders (obstructive sleep apnea, restless legs, and periodic limb movement syndrome).

2. An unstable musculoskeletal problem that limit activities of daily living (e.g., severe joint and low back pain)
3. Unstable or severe medical illnesses (e.g., uncontrollable diabetes mellitus, asthmatic exacerbation, chronic obstructive pulmonary diseases, heart failure exacerbation, unstable chest pain, paralysis or weakness, or a terminal illness)
4. History of cognitive or other neurological disorders (e.g., dementia, Alzheimer's disease, Parkinson's disease, or cognitive impairment considered by the director of each research site)
5. History of psychiatric disorders or suicidal ideation (e.g., mania, major depression, and alcohol or substance abuse)
6. Use of medications to help them sleep more than once a week

Data Collection

Data were obtained through a questionnaire-face-to-face interview by the principal investigator. However, for sensitive questions to which participants may not respond truthfully, including questions about depressive symptoms and social connectedness scales (social network and social support), the principal investigator allowed time for all participants to complete information privately and return that material to the principal investigator. For participants who could not read, the principal investigator read those questionnaires for them. Multiple questionnaires were used to measure the following variables: demographic data, health conditions, pain, depressive symptoms, social connectedness, physical activity, and sleep quality (see Appendix E). Each interview session took about 40 minutes on average. Self-completed questionnaires took about 10 minutes. The summary of research measurement tools is illustrated in Table 3.2.

Table 3.2

Summary of Data Collection Measures

| Variable | Measure | Number of Items (minutes) | Validity and Reliability |
|--------------------------|--|---------------------------|---|
| 1. Demographic variables | • Demographic questionnaire | 6 (1) | |
| 2. Health conditions | • Health condition questionnaire | 10 (2) | |
| 3. Depressive Symptoms | • Thai Geriatric Depression Scale | 15 (5) | • Sensitivity and specificity (Wongpakaran, Wongpakaran, & Van Reekum, 2013) |
| 4. Pain | • The Thai Geriatric Pain Measure Short-Form | 12 (5) | • Internal consistency (Blozik et al., 2007) |
| 5. Sleep quality | • Thai-Pittsburg Sleep Quality Index | 19 (5) | • Internal consistency, test-retest reliability, sensitivity, specificity, concurrent validity (Jirapramukpitak, Darawuttimaprakorn, Punpuing, & Abas, 2009; Sitasuwan, Bussaratid, Ruttanaumpawan, & Chotinaiwattarakul, 2014) |
| | • Thai-Insomnia Severity Index | 7 (2) | • Internal consistency (Bastien, Vallières, & Morin, 2001), sensitivity and specificity, (Gagnon, Bélanger, Ivers, & Morin, 2013) |
| 6. Physical activity | • The 55 –item Physical Activity Questionnaire | 55 (20) | • Test-retest reliability and concurrent validity (Visuthipanich et al., 2009) |
| 7. Social connectedness | • Social Network • Social Support | 17 (10) | • Internal consistency (Thanakwang, 2008; Thanakwang, Ingersoll-Dayton, & Soonthorndhada, 2012) |

Instruments

Demographic data. The principal investigator developed the demographic questionnaire suitable for Thai older adults. The demographic questionnaire included questions regarding age (years), gender (code as 0 = male, 1 = female), educational level (years), marital status (code as 1 = single, 2 = married, 3 = divorced, and 4 = widowed), living situations (code as 1 = living alone, 2 = living with children, 3 = living with spouse or partner, and 4 = living with children and spouse or partner).

Exercise history. The principal investigator developed the exercise history questionnaire specifically for older adults who participate in an exercise session at elder clubs. The exercise history questionnaire included frequency of exercise per week and types of exercise that older adults have performed at elder clubs over the past month.

Health conditions. Health conditions were measured by the health condition questionnaire that was developed based on the literature review of health conditions commonly reported and affecting sleep in older adults. Participants were asked if they have ever been told by the doctor that they had the following medical conditions (the response accepted was yes or no): heart disease, hypertension or high blood pressure, diabetes, cancer, stroke, lung disease (e.g., asthma, chronic bronchitis, or emphysema), osteoporosis, arthritis, and other health problems not previously mentioned (Foley et al., 2004). The summed score for all endorsed conditions was used for analyses.

Depressive symptoms. Depressive symptoms were measured by the 15-item Geriatric Depression Scale (GDS-15). The GDS was developed and revised by Yesavage and Sheikh (1986) to evaluate depressive symptoms in older adults. Participants were asked how they felt in the last week with regard to their emotions, activities and interests,

and satisfaction about their lives. The scale has 15 items that are scored dichotomously with zero indicating a response of not having the particular depressive symptom and 1 indicating the presence of that depressive symptom (yes or no). The summed score ranged from 0 – 15. Scores equal to or more than five denoted major depressive symptoms. The GDS-15 has been translated into various languages and found high in validity and reliability. For example, Nyunt, Fones, Niti, and Ng (2009) assessed the criterion validity and reliability of 15-item Geriatric Depression Scale (GDS-15) of over 2,000 diverse older adults in Singapore. They reported the coefficient alpha of 0.84 for overall and the item correlations range from 0.77 – 0.81, and the inter-rater reliability was 0.94. In addition, at a cutoff score greater or equal to 5, the GDS-15 showed the overall sensitivity of 97% and specificity of 95%, compared to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (Nyunt et al., 2009). The GDS-15 was translated into Thai and used for screening depressive symptoms by the Department of Mental Health (2011). The GDS-15 was tested in 237 Thai elders, and using the cutoff score ≥ 5 , sensitivity and specificity were 92% and 87%, respectively (Wongpakaran et al., 2013).

Pain. Pain was assessed by the Geriatric Pain Measure Short-Form. Pain is a multidimensional experience, including sensory and emotional experiences and effect on mood, physical function, and quality of life (Ferrell, Stein, & Beck, 2000). Given the concept of pain, Ferrell et al. (2000) developed the full version of the Geriatric Pain Measure consisting of 24 items to capture self-reported pain intensity and pain related physical function, mood, and social function. The Geriatric Pain Measure was revised into a short form by Blozik et al. (2007) to eliminate burden for respondents. The Geriatric Pain Measure Short-Form (GPM-12) measured experiences of pain symptoms

over the past month. The GPM-12 consisted of 12 items, ten of which are scored dichotomously (yes and no), and two of which are scored on a scale of 0 (no pain) to 10 (severe pain). The summed raw score ranged from 0 – 30. The raw score then was adjusted to a scale of 0 to 100 before analyzing the relationship among variables. A higher score indicates higher pain intensity. Cronbach's alpha coefficient for the GPM-12, tested in 1,059 older adults, was 0.92 (Blozik et al., 2007). The principal investigator conducted the forward and backward translation of the GPM-12 into Thai. The Thai version of the GPM-12 was tested in 50 older adults, and the coefficient alpha was 0.77.

Sleep quality. Sleep quality was measured by the Thai version of the Pittsburgh Sleep Quality Index (PSQI) (Jirapramukpitak et al., 2009; Sitasuwan et al., 2014) and the Thai version of the Insomnia Severity Index (ISI) (Bastien et al., 2001). The PSQI was originally constructed as a mean to measure subjective and objective sleep quality by Buysse et al. (1989). The PSQI consists of 19 items that are grouped into seven domains, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medicine, and daytime dysfunction. The score for each domain ranges from 0 - 3 (no difficulty - severe difficulty). Seven domains are summed to produce the global sleep quality score (the global PSQI), ranging from 0 – 21. A PSQI score greater than 5 was indicative of poor sleep quality.

The validity and reliability testing of the PSQI were conducted in diverse-ethnic populations. For validity, Ait-Aoudia et al. (2013) conducted the validity testing of the French version of the PSQI in 70 adults who were exposed to traumatic events. The findings showed a significant association of the PSQI with the measures of anxiety symptoms and post-traumatic stress disorder ($p < 0.001$). This study also revealed that a

cutoff score more than 5 provided sensitivity of 87% and specificity of 58%. For reliability, the PSQI was tested in 50 Italian young and older adults and reported a high overall reliability of the Italian-PSQI, with a Cronbach's alpha coefficient of 0.83 and test-retest reliability of 0.773 (Curcio et al., 2013). This value is consistent with the reliability testing of the Brazilian-Portuguese version of the PSQI, which was equal to 0.83 (Bertolazi et al., 2011). The PSQI was translated in Thai and tested in 90 Thai older adults (Jirapramukpitak & Tanchaiswad, 1996). It showed a Cronbach's alpha coefficient of 0.85 and a test-retest reliability of 0.87. In addition, Sitasuwan et al. (2014) reported a sensitivity of 77.78 % and specificity of 93.33 % when tested in Thai adults with depressive symptoms, using a cutoff score greater than five.

The ISI specifically measures insomnia symptoms, a common type of sleep disturbance in older adults. The ISI measures three aspects of insomnia, including characteristics of insomnia, severity, and insomnia consequences (Bastien et al., 2001). Participants were asked to report experiences with insomnia symptoms over the past month. The ISI consists of seven items, including the severity of sleep onset, severity of sleep maintenance difficulties, satisfaction with current sleep patterns, interference with daily functioning, noticeability of impairment attributed to sleep problems, degree of distress, and concerns caused by sleep problems (Bastien et al., 2001). The score for each item ranges from 0 – 4. The summed score ranges from 0 – 28, which is divided into four categories as 0 - 7 (no clinically significant insomnia), 8 – 14 (subthreshold insomnia), 15 – 21 (moderate insomnia), and 22 – 28 (severe insomnia). A higher score indicates more severity in insomnia. The ISI, tested in 78 older adults, had coefficient alpha of 0.76 (Bastien et al., 2001). The cutoff score above 14 indicated clinical insomnia with a

sensitivity of 82.4% and specificity of 82.1% (Gagnon, Bélanger, Ivers, & Morin, 2013). The discriminative capacity of each individual item for the detection of insomnia from this study showed medium to high correlations with the total ISI score ($r = 0.65 - 0.84$). Items related to dissatisfaction, interference, and preoccupation about sleep difficulties showed a higher power to detect insomnia ($r = 0.83 - 0.84$) than those items related to difficulty falling asleep and early morning awakenings ($r = 0.65-0.66$). The ISI was translated in Thai and tested in 20 Thai adults with a mean age 46.98. Cronbach's alpha coefficient was 0.91 (Keaw-Pang, 2004).

Physical activity behavior. Physical activity behavior was measured by the 55 item self-reported physical activity questionnaire (SPAQ) (Visuthipanich et al., 2009). The SPAQ is composed of five categories, including household physical activity, occupational physical activity, leisure time, transportation, and other physical activities not previously mentioned. Participants were asked if they engaged in each of the activities listed in the questionnaire over the past seven days. Each item is scored as the range of hours per week (0 – 1, > 1 – 3, > 3 – 5, > 5 – 7, > 7 – 9, and > 9 hours). Before being multiplied by the metabolic equivalent (MET) value, the response for each activity was recoded into the scales as 0.5 (0 – 1), 2 (> 1 – 3), 4 (> 3 – 5), 6 (> 5 – 7), 8 (> 7 – 9), and 10 (> 9). All items are categorized into three levels of intensity based on the MET value, including low-intensity activity (MET = 0 – 2.9); moderate-intensity activity (MET = 3.0 – 5.9), and high-intensity activity (MET = > 5.9). The test-retest reliability for the SPAQ, tested in 150 Thai elders, ranged from 0.68 - 0.94 (Visuthipanich et al., 2009). A summed score of the metabolic equivalent value from each activity was computed for analyses.

Social connectedness. Social connectedness was measured by the family and friend relationship questionnaire (Thanakwang et al., 2012). This questionnaire is composed of a 6-item of social network scale (Lubben et al., 2006) and an 11-item social support scale (Krause & Markides, 1990). The social network scale measures the number of persons in the network in which older adults regularly contact, call for help, and discuss private matters. All items are grouped into 3-item family networks and 3-item friend networks. Each item score ranges from 0 – 5 (0 = none, 1 = one, 2 = two, 3 = three or four, 4 = five thru eight, 5 = nine or more). The total score ranges from 0 – 15. The coefficient alpha for social networks, tested in 469 Thai older adults, was 0.81 (Thanakwang et al., 2012). The scores for all items were summed for analyses.

The social support scale consists of 11 items (2 informational support items, 4 emotional support items, and 5 instrumental support items) (Thanakwang et al., 2012). Each item is rated on a 4-point scale from 0 (none) to 3 (very often). A summed score ranges from 0 – 33. The Cronbach's alpha coefficient value for social support, tested in 469 Thai older adults, was 0.90 (Thanakwang et al., 2012). The summed score was used for analyses.

Human Subjects' Protection

The current project qualified for expedited review due to minimal potential risks associated with participation in the study. Although no physical risk associated with participation in the study could be found, psychological risk related to personal or sensitive information in interview questionnaires, social risk, and possible invasion of privacy of the subjects could occur. First, psychological risk was related to personal or sensitive information in interview questionnaires. As all participants were asked to

provide information about demographic characteristics, health problems, pain, depressive symptoms, social connectedness, sleep quality, and physical activity, these questionnaires might have a small likelihood of the psychological risk if participants felt embarrassed to answer, particularly for the sensitive questions related to depressive symptoms and social connectedness (family and friend networks and support). To minimize psychological risk, all participants were free to refuse to respond to any questions that might make them feel uncomfortable, and they were allowed time to complete these questionnaires privately. In addition, participants who may have reported depressive symptom scores that indicated depression or responses suggested they might harm to themselves or others would have been referred to the directors of elder clubs or health promotion hospitals for evaluation.

Second, social risk related to the participation in this study was minimal. In particular, as participants in this study included elder club members, some elder club members who were willing but not eligible to participate might feel left out of activities with their friends. This issue might affect their social interaction with others and exercise participation. To prevent feelings of being excluded from participating in research during the recruitment process, all willing persons were assured that their confidentiality was protected whether they participated in the study or not. In addition, the principal investigator and the director of each elder club explained that there could be benefits for older adults who did not take part in the study as they could indirectly benefit from the study results. For instance, the results from the study may show the benefits of exercise they already performed on sleep promotion and encourage others to join their exercise activities.

Finally, a possible invasion of privacy of the subjects could occur since participants who responded to questions that indicated depressive symptoms or harm to themselves or others were referred to the directors of elder clubs or health-promotion hospitals. Regarding this, in the signing of consents, the principal investigator asked all participants for agreement to report this information to the directors of elder clubs or health-promotion hospitals before they decided to participate into the study. Another means of insuring privacy during the screening process, the signing of informed consents, and data collection for elder exercise participants was that these were conducted in a private room at elder centers; for older adults who performed an exercise program at home and those who did not regularly exercise, these were conducted in a private room at the health promotion hospitals.

Before the signing of informed consents, the principal investigator explained the purposes of the study and the human subjects' protection in detail and reassured all participants that the participation in the study was voluntary, their personal data would be kept confidential, and they could withdraw from the study at any time without any penalty or loss of any benefits. The principal investigator read the consent document word by word and allowed all participants to ask if they did not understand. Then, they were asked to repeat information being explained to confirm their comprehension to the consent. Providing at least 80 % correct responses (4 from 5 questions) indicated their comprehension of the consent. If they were unable to answer questions correctly or at less than 80 %, the principal investigator repeated all information in the consent form until they are able to answer correctly. The guide of assessment questions used in this section included (a) what is this study being done?, (b) what are activities involved in this study?,

(c) how long will it take you to participate in the study?, (d) what is the risk associated with the participation in the study?, and (e) could you explain your understanding of your rights as a study participant? Finally, the principal investigator also provided opportunities for all participants to bring up concerns prior to signing the informed consent.

To protect the confidentiality, informed consents and all completed data collection forms were encoded by the numeric codes. These numeric codes were used to identify participants' names and to link to other personal information. Information that can link to participants' personal information was kept separately from the forms on which their responses on the questionnaires were recorded and was accessible only by the principal investigator. Participants' names and codes and data responses in the data collection forms were also stored in separate, electronic Microsoft Excel files with different passwords used to access the data. The data keys were kept in a securely locked drawer and destroyed at the end of the study. All data kept in an electronic form were stored in a Box on a secure MU network and retained for seven years after the completion of the study as is the MU policy before being deleted from the files.

Participation in the study may be beneficial to participants in increasing awareness of regular exercise that could help promote sleep quality. Benefits would also impact other people in communities through the study's findings regarding ways to encourage older adults in communities to attend exercise sessions and other activities at elder clubs or perform exercise regularly at home. Moreover, the current study offered additional insights on the relationships among exercise participation, social

connectedness, and sleep quality that can guide interventions or programs to promote sleep in older population through the enhancement of social connectedness.

Data Management and Analysis

The principal investigator checked the data collection for completeness and accuracy at the time of data collection. Then, data collected from all questionnaires were entered into a Microsoft Excel worksheet by the principal investor. Double data entry was conducted and compared between two worksheets for accuracy before analyzing. SPSS version 23 was used to analyze the data. A statistician was consulted for all data analysis procedures and verification of results.

Descriptive statistics including mean, standard deviation, frequency, and percentage were computed to describe the samples' demographic characteristics as appropriate for the level of measurement of the variables. Range, mean, and standard deviation were used to explain social connectedness (social network and social support), GDS, GMP-12, SPAQ (MET/week), and sleep quality (PSQI and ISI). The normality of dependent variables was tested before data analyses. Since the assumption of normality for scores on the measures of age, education, health conditions, GMP-12, GDS, social support, PSQI, and ISI was violated, non-parametric analyses were used instead of parametric analyses. Before comparing the differences in sleep quality across three groups (elder club exercise, home exercise, and no exercise), the homogeneity testing was conducted to what extent there was equivalence in demographic variables' data and other factors related to sleep quality across groups. Using the alpha value of $< .05$ ($\alpha < .05$) to denote statistical significance, the statistical analyses for each research question are explained below.

Research question 1 examined differences in demographic variables (gender, age, educational level, marital status, and living status), health conditions, pain, depressive symptoms, social connectedness, and physical activity among older adults who participate in elder club exercise programs, older adults who perform an exercise program at home, and older adults who do not regularly exercise.

H₀: There are no differences in age, gender, education, marital status, living status, health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity among Thai older adults who participate in elder club exercise programs, older adults who perform an exercise program at home, and older adults who do not regularly exercise.

H_a: There are differences in age, gender, education, marital status, living status, health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity among Thai older adults who participate in elder club exercise programs, older adults who perform an exercise program at home, and older adults who do not regularly exercise.

Based on this research question, exercise habits (3 groups) was an independent variable while dependent variables were demographic variables, health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity. The chi-square test was used to determine whether gender, marital status, and living status differed significantly across the three groups, given a significance value less than .05 ($p < .05$). Marital status was grouped into two groups: not being currently married and being married. Living status was categorized as living alone and living with others (children and/or with spouse or partner). There were some observed

occurrences for gender and living status variables less than five per category. Thus, Fisher's exact test was computed to examine the differences for the gender and living status variable among the three groups (Agresti & Finlay, 2009).

Differences in age, educational levels, health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity among Thai older adults who participated in elder club exercise programs, older adults who performed an exercise program at home, and older adults who did not regularly exercise were examined using parametric and nonparametric statistical analyses. Since the normality testing for these variables, except social network, did not meet the assumption, the Kruskal-Wallis test was applied. A one-way ANOVA was performed to examine the mean difference in scores on the social network measure among participants in elder club exercise, home exercise, and non-exercise. After this, a post hoc test was computed to confirm where differences occur among the three groups.

Research question 2 explored the differences in sleep quality as measured by the PSQI and the ISI among Thai older adults who participate in elder club exercise programs, compared to older adults who perform an exercise program at home and older adults who do not regularly exercise.

H₀: Sleep quality scores, measured with the PSQI and the ISI, do not differ among older adults who participated in elder club exercise programs, older adults who performed an exercise program at home, and older adults who did not regularly exercise, controlling for covariates found to be significantly different ($p < .10$) in research question 1.

H_a: Sleep quality scores, measured with the PSQI and the ISI, differ among older adults who participated in elder club exercise programs, older adults who performed an exercise program at home, and older adults who did not regularly exercise, controlling for covariates found to be significantly different ($p < .10$) in research question 1.

Regarding research question 2, the independent variable was exercise participation, and the dependent variable was the sleep quality score. Since the distributions of the PSQI scores and the ISI scores were not normal, the Kruskal-Wallis test was applied to examine the mean differences of sleep quality among the three groups instead of ANCOVA. However, the Kruskal-Wallis test cannot control for covariates found to be significantly different in research question 1.

Research question 3 determined the associations among demographic variables (age, gender, education, marital status, and living status), pain, depressive symptoms, health conditions, social connectedness (social network and social support), physical activity, and sleep quality in Thai older adults.

H₀: Scores on the measures of demographic variables, pain, depressive symptoms, health conditions, social connectedness (social networks and social support), and physical activity (MET/week) will not be associated with sleep quality scores (PSQI and ISI).

H_a: Scores on the measures of demographic variables, pain, depressive symptoms, health conditions, social connectedness (social networks and social support), and physical activity (MET/week) will be associated with sleep quality scores (PSQI and ISI).

In research question 3, sleep quality as measured by the PSQI and the ISI was a dependent variable. Independent variables included age, gender, education, marital status, living status, pain, depressive symptoms, health conditions, social connectedness (social

network and social support), and physical activity. Since the assumptions of normality for the PSQI and the ISI were violated, the Spearman rank-order correlation (Spearman's rho) was performed to examine whether the scores on the measures of pain, depressive symptoms, health conditions, social connectedness, and physical activity were associated with the scores on the measures of the PSQI and the ISI. A point biserial correlation (r_{pb}) was performed to explore the associations among categorical variables: gender (code as 0 = male, 1 = female), marital status (code as 0 = being married, 1 = not being currently married), and living status (code as 0 = living alone, 1 = living with someone) and PSQI and ISI scores. The point biserial correlation, a value of Pearson's product moment correlation, was used to analyze the correlation between a dichotomous independent variable and a continuous dependent variable (Kornbrot, 2014).

Research question 4 investigated how well pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity predicted sleep quality (PSQI and ISI), controlling for demographic variables (age, education, gender, and marital status).

H₀: After controlling for demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity cannot predict sleep quality scores (PSQI and ISI).

H_a: After controlling for demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity can predict sleep quality scores (PSQI and ISI).

All continuous variables (age, education, health conditions, pain, depressive symptoms) were checked for multicollinearity by using a tolerance value or a variance of

inflation factor (VIF) before being entered into a logistic regression analysis. Tolerance values less than .10 or VIF values greater than 10 denoted multicollinearity (Lomex & Hahs-Vaughn, 2015). Because the scores for PSQI and ISI scales were skewed, a binary logistic regression analysis was used to examine whether poor sleep quality can be predicted from variables mentioned at the outset of this paragraph.

The global PSQI scores were categorized into two groups by using the cutoff score more than 5 to indicate poor sleep quality or sleep disturbance (code as 0 = good sleep quality, 1 = poor sleep quality). Likewise, the summed ISI score was computed into two groups by using the cutoff score more than 7 to indicate insomnia (code as 0 = no insomnia, 1 = insomnia). Age, education, gender (code as 0 = male, 1 = female), and marital status (code as 0 = being married, 1 = not being married) were entered simultaneously into the first block of a hierarchical logistic regression model. Marital status, but not living status, was entered in the model to limit the number of predictor variables in the logistic regression equation. Next, pain, depressive symptom, health conditions, social connectedness (social network and social support), and physical activity variables were entered simultaneously into the second block of the model to detect predictive effects over that of variables already included. The omnibus chi-square test, Nagelkerke R square (R^2), and the percentage of correct classification were used to determine the overall model fit and justify how well the model explained poor sleep quality (Lomax & Hahs-Vaughn, 2015; Osborne, 2015). The omnibus chi-square test is the difference in the 2-log likelihood (-2LL) value between the baseline model and the larger model: the larger the difference between these two models, the better model fits (Osborne, 2015). Nagelkerke R square (R^2) is a proportion of variance for poor sleep

quality that the model successfully explained (Lomax & Hahs-Vaughn, 2015). The Wald statistic was used to assess the significance of coefficients for individual predictors. Besides this, an odds ratio was used to indicate the strength of each predictor variable contributing to poor sleep quality (Stoltzfus, 2011).

References

- Agresti, A. & Finlay, B. (2009). Statistical methods for the social sciences. In D. Lynch (Ed.), *Analyzing association between categorical variables* (pp. 221-241). New Jersey: Prentice Hall, Inc.
- Ait-Aoudia, M., Levy, P. P., Bui, E., Insana, S., de Fouchier, C., Germain, A., & Jehel, L. (2013). Validation of the French version of the Pittsburgh Sleep Quality Index Addendum for posttraumatic stress disorder. *European Journal of Psychotraumatology*, 4, 1-8. doi:10.3402/ejpt.v4i0.19298
- Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, 2(4), 297-307. Retrieved from <https://www.nederlandsautismeregister.nl/assets/Documenten/Bastien%202001%20297%20SIS.pdf>
- Bertolazi, A. N., Fagondes, S. C., Hoff, L. S., Dartora, E. G., da Silva Miozzo, I. C., de Barba, M. E. F., & Barreto, S. S. M. (2011). Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. *Sleep Medicine*, 12(1), 70-75. doi:10.1016/j.sleep.2010.04.020
- Blozik, E., Stuck, A. E., Niemann, S., Ferrell, B. A., Harari, D., Renteln-Kruse, W., . . . Clough-Gorr, K. M. (2007). Geriatric pain measure short form: development and initial evaluation. *Journal of the American Geriatrics Society*, 55(12), 2045-2050 2046p. doi:10.1111/j.1532-5415.2007.01474.x
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and

research. *Psychiatry Research*, 28(2), 193-213. doi:10.1016/0165-1781(89)90047-4

- Carlson, S. A., Fulton, J. E., Schoenborn, C. A., & Loustalot, F. (2010). Trend and prevalence estimates based on the 2008 Physical Activity Guidelines for Americans. *American Journal Of Preventive Medicine*, 39(4), 305-313. doi:10.1016/j.amepre.2010.06.006
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155-159. Retrieved from <http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf>
- Curcio, G., Tempesta, D., Scarlata, S., Marzano, C., Moroni, F., Rossini, P., . . . Gennaro, L. (2013). Validity of the Italian Version of the Pittsburgh Sleep Quality Index (PSQI). *Neurological Sciences*, 34(4), 511-519. doi:10.1007/s10072-012-1085-y
- Ferrell, B. A., Stein, W. M., & Beck, J. C. (2000). The Geriatric Pain Measure: validity, reliability and factor analysis. *Journal of the American Geriatrics Society*, 48(12), 1669-1673. doi: 10.1111/j.1532-5415.2000.tb03881.x
- Foley, D., Ancoli-Israel, S., Britz, P., & Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: Results of the 2003 National Sleep Foundation Sleep in America Survey. *Journal of Psychosomatic Research*, 56(5), 497-502. doi:10.1016/j.jpsychores.2004.02.010
- Gagnon, C., Bélanger, L., Ivers, H., & Morin, C. M. (2013). Validation of the Insomnia Severity Index in primary care. *Journal Of The American Board Of Family Medicine: JABFM*, 26(6), 701-710. doi:10.3122/jabfm.2013.06.130064
- Jirapramukpitak, T., Darawuttimaprakorn, N., Punpuing, S., & Abas, M. (2009). Validation and factor structure of the Thai version of the EURO-D scale for

depression among older psychiatric patients. *Aging & Mental Health*, 13(6), 899-904. doi:10.1080/13607860903046479

Jirapramukpitak, T., & Tanchaiswad, W. (1997). Sleep disturbances among nurses of Songklanagarind Hospital. *Journal of Psychiatric Association of Thailand*, 42(3), 123-132. Abstract retrieved from <http://www.dmh.go.th/abstract/details.asp?id=542>

Keaw-Pang, P. (2004). การนอนหลับผิดปกติและปัจจัยที่เกี่ยวข้องของผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่ได้รับการฟอกเลือดด้วย. [Sleep disturbances and factors predicting sleep quality in patients with chronic kidney disease undergoing hemodialysis]. (Unpublished master thesis). Chulalongkorn University, Thailand.

Kornbrot, D. (2014, April 22). Point biserial correlation. *Wiley StatsRef: Statistics Reference Online*. doi: 10.1002/9781118445112.stat06227

Krause, N., & Markides, K. (1990). Measuring social support among older adults. *The International Journal of Aging and Human Development*, 30(1), 37-53. Abstract retrieved from <http://ahd.sagepub.com/content/30/1/37.short>

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-based dentistry*, 7(1), 24-25. Retrived from <http://www.nature.com/ebd/journal/v7/n1/pdf/6400375a.pdf>

Lomex, R. G. & Hahs-Vaughn, D. L. (2015). Statistical concepts: A second course. In R. G. Lomex & D. L. Hahs-Vaughn (Eds.), *Logistic regression* (pp. 419-462). New York: Taylor & Francis Groups, LLC.

Lubben, J., Blozik, E., Gillmann, G., Iliffe, S., von Renteln Kruse, W., Beck, J. C., & Stuck, A. E. (2006). Performance of an abbreviated version of the Lubben Social

- Network Scale among three European community-dwelling older adult populations. *Gerontologist*, 46(4), 503-513. doi 10.1093/geront/46.4.503
- Nyunt, M. S. Z., Fones, C., Niti, M., & Ng, T. (2009). Criterion-based validity and reliability of the Geriatric Depression Screening Scale (GDS-15) in a large validation sample of community-living Asian older adults. *Aging & Mental Health*, 13(3), 376-382 377p. doi:10.1080/13607860902861027
- Osborne, J. W. (2015). *Best practices in logistic regression*. University of Louisville. California: Thousand Oaks.
- Sitasuwan, T., Bussaratid, S., Ruttanaumpawan, P., & Chotinaiwattarakul, W. (2014). Reliability and validity of the Thai version of the Pittsburgh Sleep Quality Index [Supplemental material]. *Journal of the Medical Association of Thailand*, 97(3), S57-S67. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/24772581>
- Stoltzfus, J. C. (2011). Logistic regression: a brief primer. *Academic Emergency Medicine*, 18(10), 1099-1104. doi: 10.1111/j.1553-2712.2011.01185.x
- Thanakwang, K. (2008). Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Thai Journal of Nursing Research*, 12(4), 243-258. Retrieved from http://www.tnc.or.th/files/2011/05/tnc_journal-631/thai_journal_of_nursing_research_vol_12_no_4_oct_33974.pdf.
- Thanakwang, K., Ingersoll-Dayton, B., & Soonthorndhada, K. (2012). The relationships among family, friends, and psychological well-being for Thai elderly. *Aging & Mental Health*, 16(8), 993-1003. doi:10.1080/13607863.2012.692762
- The Department of Mental Health. (2011). *Geriatric depression depression scale*. Retrieved from <http://www.dmh.go.th/test/depress/asheet.asp?qid=1>

- Viwatpanich, K. (2012). Situation and direction of research-thesis in elder club in Thailand. *Thammasat Medical Journal*, 12(2), 331-337. Retrieved from <http://www.tci-thaijo.org/index.php/tmj/article/view/14026/12759>
- Wongpakaran, N., Wongpakaran, T., & Van Reekum, R. (2013). The Use of GDS-15 in Detecting MDD: A comparison between residents in a Thai long-term care home and geriatric outpatients. *Journal Of Clinical Medicine Research*, 5(2), 101-111. doi:10.4021/jocmr1239w
- Wu, C. Y., Su, T. P., Fang, C. L., & Yeh Chang, M. (2012). Sleep quality among community-dwelling elderly people and its demographic, mental, and physical correlates. *J Chin Med Assoc*, 75(2), 75-80. doi:10.1016/j.jcma.2011.12.011
- Yang, P.-Y., Ho, K.-H., Chen, H.-C., & Chien, M.-Y. (2012). Exercise training improves sleep quality in middle-aged and older adults with sleep problems: a systematic review. *Journal of Physiotherapy (Elsevier)*, 58(3), 157-163. doi:10.1016/S1836-9553(12)70106-6
- Yesavage, J. A., & Sheikh, J. I. (1986). Geriatric Depression Scale (GDS) recent evidence and development of a shorter violence. *Clinical Gerontologist*, 5(1-2), 165-173.

Chapter Four

Results

Chapter 4 contains the findings of the study, including demographic characteristics of the sample, the internal consistency of study measures, and the normality testing of variables. This chapter also presents the results with regard to research questions.

Demographic Characteristics of the Sample

A total of 180 participants were recruited from three communities where elder clubs were located. Participants were divided into three groups based on the inclusion criteria: elder club exercise ($n = 60$), home exercise ($n = 60$), and non-exercise ($n = 60$). Of the total (180 participants), participants' age ranged from 60 to 92 years, with a mean of 69.41 ($SD = 6.63$). Participants' educational attainment ranged from 4 - 22 years with a mean of 6.56 ($SD = 4.42$). The majority of participants were female and married. More than half of participants lived with a spouse and children. Demographic characteristics of the sample were displayed in Table 4.1.

For health conditions, the highest percentage of participants had been diagnosed with one health condition ($n = 70, 38.9\%$), followed by 37.7% ($n = 57$) without any conditions. The common health problems reported by the sample were hypertension ($n = 87, 48.3\%$), following by dyslipidemia ($n = 57, 29.4\%$) and diabetes mellitus ($n = 24, 13.3\%$).

Table 4.2 displays exercise characteristics for participants who performed an exercise session at elder clubs. Each participant performed more than one type of exercises, such as Tai Chi, Thai wong exercise, and traditional exercise (Paslop dance and

Norabic exercise). However, almost all participants of the elder club exercise group performed Tai Chi, followed by Thai waltz exercise. In addition, the majority of participants in the elder club group reported they performed exercise 4 to 5 days per week.

Psychometric Analysis of Study Variables

Table 4.3 displays the psychometric properties of study variables, including mean, standard deviation, median, range, skewness, and coefficient alpha. Coefficient alpha was computed to examine internal consistency reliability of research instruments. Computed values, which ranged from 0.76 to 0.85, indicated that the scales of GPM-12, GDS-15, social support, PSQI, and ISI had good reliability. The coefficient alpha value for social network scales was 0.69, which approaches the acceptable value (≥ 0.7) as recommended by Polit & Beck (2004).

The Kolmogorov-Smirnov Test and skewness values were computed to investigate the normality for scale variables, including age, health conditions, pain, depressive symptoms, social connectedness (social network and social support), physical activity, and sleep quality (PSQI and ISI). The results as shown in Table 4.3 illustrated that only the scores of the social network scale had normal distribution ($p = .82$).

Table 4.1

Demographic Characteristics of the Sample (N = 180)

| Variable | Frequency (Percentage) |
|-----------------------|------------------------|
| Gender | |
| Females | 140 (77.8) |
| Males | 40 (23.2) |
| Marital Status | |
| Single | 11 (6.1) |
| Married | 114 (63.3) |
| Divorced | 9 (5.0) |
| Widowed | 46 (25.6) |
| Living Status | |
| Alone | 14 (7.8) |
| Children | 53 (29.4) |
| Spouse/Partner | 20 (11.1) |
| Spouse and Children | 93 (51.7) |

Table 4.2

Exercise Characteristics for Participants at Elder Clubs (N = 60)

| Variable | Frequency (Percentage) |
|---|------------------------|
| Types of Exercise* | |
| Tai Chi | 59 (98.3) |
| Thai Wand Exercise | 47 (78.3) |
| Traditional Dance (Paslop dance) | 34 (56.7) |
| Norabic Exercise | 37 (61.7) |
| Exercise Frequency (days per week) | |
| 2 – 3 | 5 (8.3) |
| 4 – 5 | 47 (78.3) |
| > 5 | 8 (13.3) |

Note. * Each person may perform more than one type of exercise.

Table 4.3

Psychometric Properties of Study Variables

| Variable | <i>M (SD)</i> | <i>Mdn</i> | Range | | Skewness ^a | Coefficient Alpha (α) |
|----------------------|---------------|------------|-----------|---------------|-----------------------|-----------------------------------|
| | | | Potential | Actual | | |
| Age | 69.41 (6.63) | 67 | NA | 60 - 92 | 0.85*** | NA |
| Education | 6.56 (4.42) | 4 | NA | 4 - 22 | 1.66*** | NA |
| Health Conditions | 1.09 (0.98) | 1 | NA | 0 - 4 | 0.68*** | NA |
| Pain | 5.83 (11.09) | 0 | 0 - 100 | 0 - 57.50 | 2.27 *** | 0.78 |
| Depression | 1.94 (2.34) | 1 | 0 - 15 | 0 - 9 | 1.34*** | 0.76 |
| Social Connectedness | | | | | | |
| Social Network | 19.12 (5.45) | 19 | 0 - 30 | 3 - 30 | - .11 | 0.69 |
| Social Support | 22.76 (9.13) | 23 | 0 - 44 | 2 - 44 | 0.22* | 0.78 |
| Physical Activity | 82.39 (42.7) | 77.06 | NA | 7.25 - 264.50 | 0.83** | NA |
| Sleep quality | | | | | | |
| PSQI | 5.34 (3.52) | 4 | 0 - 21 | 0 - 15 | 0.79*** | 0.79 |
| ISI | 3.69 (3.93) | 2 | 0 - 28 | 0 - 22 | 1.77*** | 0.85 |

Note. M = mean, SD = standard deviation, Mdn = median, PSQI = Pittsburgh Sleep Quality Index, ISI = Insomnia Severity Index, NA = not applicable, ^athe Kolmogorov-Smirnov Test, * $p < .05$, ** $p < .01$, *** $p < .001$

Analyzed Results According to Research Questions

Research question 1. Are there differences in demographic variables (gender, age, educational level, marital status, and living status), health conditions, pain, depressive symptoms, social connectedness (social network and social support), and physical activity among older adults who participate in an elder club exercise program, older adults who perform an exercise program at home, and older adults who do not regularly exercise?

Table 4.4 illustrates differences in frequency and percentage among the groups of elder club exercise, home exercise, and non-exercise for categorical variables. The data analyses showed that there was no significant difference in living status across groups. Significant differences were found for gender ($p < .001$) and marital status ($p < .05$). In particular, fewer male participants engaged in an exercise session at the clubs. In addition, the elder club group included a higher percentage of participants who were not currently married than were in the other two groups.

Table 4.5 presents mean, standard deviation, median, and comparisons among groups of participants for continuous variables. The Kruskal-Wallis Test showed statistically significant differences in the mean score on the measures of pain, depressive symptoms, social support, and physical activity but not for age, education, and health conditions. Table 4.5 also illustrates that the non-exercise group had poorer scores on almost every variable, including health conditions, pain, depressive symptoms, social network, and physical activity, except for social support.

An analysis of variance (ANOVA) was conducted to compare the mean scores on the social network scale among elder club exercise, home exercise, and non-exercise

groups. There was a significant difference in the mean scores on the social network scale for the three groups as shown in Table 4.5. Post Hoc comparisons using the Tukey's HSD (honest significant) test indicated that the home exercise group reported a higher social network score than the elder club exercise group ($p = .046$) and the non-exercise group ($p < .001$).

Research question 2. Are there differences in sleep quality (measured by the PSQI and the ISI) among older adults who participate in an elder club exercise program, older adults who perform an exercise program at home, and older adults who do not regularly exercise, controlling for covariates found to be significantly different ($p < .10$) in research question 1.?

The Kruskal-Wallis Test was conducted to examine differences on a mean rank score of sleep quality, measured by the PSQI and the ISI, among the three groups of participants. However, factors found to be significantly different among the three groups, including pain, depressive symptoms, social connectedness (social network and social support), and physical activity were not able to be controlled because of the limitation of the Kruskal-Wallis Test. The mean rank scores calculated for the Kruskal-Wallis Test differed from the mean scores as presented in Table 4.5. There was not a statistically significant difference among exercise groups on the PSQI scores with a mean rank of 82.75 for the elder club exercise group, 93.00 for the home exercise group, and 95.75 for the non-exercise group. Similarly, no statistically significant difference of the scores on the ISI measure was found among exercise groups with a mean rank of 85.96 for the elder club exercise group, 94.83 for the home exercise group, and 90.72 for the non-exercise group. In addition, participants in the elder club exercise group reported the

lowest scores on both PSQI and ISI scales, which indicated better sleep quality, when compared to the other two groups.

Table 4.4

Group Differences for Categorical Variables

| Variables | Frequency (Percentage) | | | <i>Test Statistic</i> | <i>p-value</i> |
|-----------------------|------------------------------|------------------------|-----------------------|------------------------|----------------|
| | Elder Club Exercise n (%) | Home Exercise n (%) | Non-Exercise n (%) | | |
| Gender | | | | | |
| Females | 59 (98.3) | 39 (65.0) | 42 (70.0) | Fisher's test = 22.436 | .000 |
| Males | 1 (1.7) | 21 (35.0) | 18 (30.0) | | |
| Marital Status | | | | | |
| Married | 31 (48.3) | 38 (63.3) | 45 (75.0) | $X^2 = 7.033$ | .030 |
| Not Currently Married | 29 (51.7) | 22 (36.7) | 15 (25.0) | | |
| Living Status | | | | | |
| Alone | 9 (15.0) | 3 (5.0) | 2 (3.3) | Fisher's test = 5.66 | .066 |
| With Someone | 51 (85.0) | 57 (95.0) | 58 (96.7) | | |

Note. *df* (degree of freedom) = 2, X^2 = Chi-square

Table 4.5

Group Differences for Continuous Variables

| Variable | Elder Club Exercise | | Home-Exercise | | Non-Exercise | | Kruskal-Wallis H Test ^a | <i>p-value</i> |
|----------------------|---------------------|------------|-----------------|------------|-----------------|------------|------------------------------------|----------------|
| | <i>(N = 60)</i> | | <i>(N = 60)</i> | | <i>(N = 60)</i> | | | |
| | <i>M (SD)</i> | <i>Mdn</i> | <i>M (SD)</i> | <i>Mdn</i> | <i>M (SD)</i> | <i>Mdn</i> | | |
| Age | 68.63 (5.45) | 67 | 69.58 (6.59) | 69 | 70.00(7.69) | 67 | 0.412 | .814 |
| Education | 7.27 (4.74) | 4 | 6.43 (4.23) | 4 | 5.98 (4.26) | 4 | 3.967 | .138 |
| Health Conditions | 1.05 (0.89) | 1 | 1.0 (1.06) | 1 | 1.20 (0.99) | 1 | 1.92 | .383 |
| Pain | 4.83 (9.73) | 0 | 3.42 (8.62) | 0 | 9.25 (13.62) | 0 | 9.292 | .010 |
| Depressive Symptoms | 1.65 (2.23) | 1 | 1.7 (2.24) | 1 | 2.48 (2.48) | 2 | 6.088 | .048 |
| Social Connectedness | | | | | | | | |
| Social Network | 18.83 (4.89) | 20 | 21.13 (5.8) | 21 | 17.40 (5.04) | 17 | 7.701 ^b | .001 |
| Social Support | 20.95 (9.29) | 19.5 | 22.17 (7.84) | 23.5 | 25.18 (9.77) | 26 | 6.196 | .045 |
| Physical Activity | 103.96 (44.18) | 91.0 | 80.45 (40.04) | 77.75 | 62.78 (33.3) | 64.44 | 26.610 | .000 |
| Sleep Quality | | | | | | | | |
| PSQI | 4.73 (3.07) | 4 | 5.45 (3.47) | 4.5 | 5.85 (3.94) | 4.5 | 2.10 | .35 |
| ISI | 3.42 (4.12) | 2 | 3.90 (3.87) | 2 | 3.77 (3.85) | 2 | 0.90 | .64 |

Note. PSQI = Pittsburg Sleep Quality Index, ISI = Insomnia Severity Index, M = mean, SD = standard deviation, Mdn = median,

^a Degrees of freedom = 2 for all group comparisons, ^b the F test with degree of freedom between group = 2 and within group = 177

Research question 3. What are the associations among demographic variables, pain, depressive symptoms, health conditions, social connectedness (social network and social support), physical activity, and sleep quality scores (PSQI and ISI)?

A point biserial correlation (r_{pb}) was calculated to determine if categorical variables (gender, marital status, and living statuses) were associated with the PSQI and the ISI scores. The results revealed that there were no statistically significant associations among gender, marital status, living status, and the PSQI and ISI scores. In addition, the Spearman rank-order correlation (Spearman's rho) was calculated to determine if age, education, health conditions, pain, depressive symptoms, social network, and physical activity were associated with the PSQI and the ISI scores. A two-tailed test of significance indicated that age ($p = .001$), health conditions ($p = .016$), pain ($p = .001$), depressive symptoms ($p < .001$), and the ISI ($p < .001$) had positive correlations with the PSQI score, suggesting that as age, number of health conditions, pain intensity, and depressive symptoms increase, sleep disturbances increase. Social network ($p = .016$) and physical activity ($p < .001$) were negatively correlated with the PSQI score, indicating that as social network and physical activity increase, sleep disturbances decrease. Only the correlation between the ISI score and the PSQI score was large in magnitude; all other correlation coefficients were small in magnitude (Cohen, 1992).

The Spearman's rho also showed a positive and statistically significant correlation between sleep quality as measured by the ISI with age ($p = .01$), health conditions ($p = .000$), pain ($p = .001$), and depressive symptoms ($p < .001$), suggesting that as age, number of health conditions, pain intensity, and depressive symptoms increase, ISI scores increase (i.e., poor sleep quality). Conversely, years of education ($p = .012$) and physical

activity ($p < .001$) were negatively associated with ISI scores, suggesting as years of education and physical activity increase, ISI scores decline (i.e., improve). The summary of correlations among variables is illustrated in Table 4.6.

Table 4.6

Spearman's Rho and Point Biserial Correlation Coefficients among Study Variables

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSQI |
|--|---------------------|----------------------|-------------------|-------|--------------------|-------------------|--------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
| 1. Gender (female) ^a | .324 ^{***} | -.155 [*] | -.129 | -.141 | .049 | .049 | .062 | -.030 | .008 | .121 | .009 | -.016 |
| 2. Marital Status ^a (non-marriage) | | -.382 ^{***} | .159 [*] | -.128 | -.081 | -.133 | .013 | -.144 | -.054 | -.156 [*] | .086 | .132 |
| 3. Living Status ^a (with someone) | | | -.048 | .028 | .005 | .031 | .002 | .121 | .106 | -.090 | -.039 | -.031 |
| 4. Age | | | | -.082 | .143 | .124 | .038 | -.165 [*] | .154 | -.377 ^{***} | .193 ^{**} | .248 ^{**} |
| 5. Education | | | | | -.181 [*] | -.024 | -.034 | .197 ^{**} | -.021 ^{**} | .169 [*] | -.186 [*] | -.137 |
| 6. Health Conditions | | | | | | .181 [*] | .243 ^{**} | -.048 | .091 | -.138 | .313 ^{***} | .180 [*] |
| 7. Pain | | | | | | | .196 ^{**} | -.258 ^{***} | .001 | -.175 [*] | .250 ^{**} | .253 ^{**} |
| 8. Depressive Symptoms | | | | | | | | -.210 ^{**} | .078 | -.151 [*] | .353 ^{***} | .294 ^{***} |
| 9. Social Network | | | | | | | | | .043 | .199 ^{**} | -.144 | -.179 [*] |
| 10. Social Support | | | | | | | | | | -.036 | .083 | .100 |
| 11. Physical Activity | | | | | | | | | | | -.260 ^{***} | -.259 ^{***} |
| 12. ISI | | | | | | | | | | | | .758 ^{***} |

Note. ISI = Insomnia Severity Index, PSQI = Pittsburg Sleep Quality Index, * $p < .05$, ** $p < .01$, *** $p < .001$, ^a Computed by a point biserial correlation (r_{pb})

Research question 4. Research question 4 investigated how well pain, depressive symptoms, health conditions, social connectedness (social network and social support), and physical activity predicted sleep quality (PSQI and ISI), when controlling for demographic variables (age, education, gender, and marital status).

After the scores for the PSQI and ISI scales were computed into two groups as described in Chapter 3, only 29 of 180 participants had ISI scores indicating poor sleep quality or insomnia. However, 68 of 180 subjects had PSQI scores indicating poor sleep quality. A small number of events per each predictor variable can create the problems of overestimated or underestimated variances of poor sleep quality (Hosmer & Lemeshow, 2000). Although at least 10 events per variable (EPV) is recommended for a logistic regression analysis, Vittinghoff and McCulloch (2007) suggested that higher percentage of Type I error was more likely in logistic regression analyses when the number of EPV was less than 5. In the current study with 10 predictor variables, a minimum of 50 cases for ISI and PSQI groups would be needed to meet Vittinghoff and McCulloch's recommendation, thus a logistic regression analysis was performed only on the PSQI outcome variable.

Tolerance values and variance inflation factor were computed to investigate multicollinearity among age, educational level, health conditions, pain, depressive symptoms, social network, social support, and physical activity, before performing the regression analysis. The results showed all tolerance values greater than .10 (range from .78 - .92) and the variance inflation factor less than 10 (range from 1.09 – 1.28), which indicated that the variables were not multicollinear and met logistic regression requirements.

Table 4.7 displays results of the hierarchical multiple logistic regression model predicting poor sleep quality as measured by the PSQI scores. In the first block, Beta coefficients for the demographic variables of age and educational level were statistically significant; the omnibus chi-square test showed a good fit as indicated by a significant change in variance of poor sleep quality [$X^2(4) = 15.566, p = .004$] and explained 11.3% of the variance in poor sleep quality with correct classification at 66.7% of cases.

After controlling for age, educational level, gender, and marital status variables as shown in the second block, the overall model was statistically significant according to the omnibus chi-square test that explained an additional 14.0% of the variance in poor sleep quality and correctly classified 71.7% of cases. In total, 25% of the variance in sleep quality was explained by all predictors in the model. The variables of pain and depressive symptoms were the only statically significant predictors in the final model. Specifically, for a one-unit increase in depressive symptoms, the odds of poor sleep quality increases by 23 % and for a one-unit increase in pain, the odds of poor sleep quality increases by 3.5 % (Speraindei, 2014).

As mentioned at the beginning of this section, because of a small number of participants with ISI scores that were indicative of insomnia, the prediction of poor sleep quality with the ISI score was not performed in this study. Descriptive statistics were calculated to examine demographic and health-related characteristics between participants with ISI scores denoting insomnia and no insomnia. Of the 29 cases with insomnia, 89.7% also reported poor sleep quality on the PSQI scale, and 27.8 % of 151 cases without insomnia reported poor sleep quality on the PSQI scale. There was a higher percentage of female participants (79.3 %) with insomnia than those without

insomnia (77.5 %). The proportion of insomnia participants who were married (58.6 %) and living with someone (89.7 %), however, differed slightly from those without insomnia (84.2% and 92.7%, respectively). Psychometric properties of continuous variables by groups, including mean, standard deviation, median, and range are illustrated in Table 4.8. The results showed insomnia participants also reported a mean score indicating poorer conditions in almost variables, except social support.

Table 4.7

Logistic Regression Analyses Predicting Poor Sleep Quality (PSQI > 5)

| Predictor | Model 1 | Model 2 | | Wald | <i>p</i> -value | OR [95% CI] |
|--|----------|-----------|-----------|-------|-----------------|----------------------|
| | <i>B</i> | <i>B</i> | <i>SE</i> | | | |
| Age | .053* | .032 | .029 | 1.200 | .273 | 1.032 [.975, 1.093] |
| Education | -.091* | -.071 | .048 | 2.214 | .137 | .931 [.848, 1.023] |
| Gender (male) | .352 | .505 | .460 | 1.209 | .272 | 1.658 [.673, 4.081] |
| Marital Status (married) | -.536 | -.734 | .406 | 3.259 | .071 | .480 [.216, 1.065] |
| Health Conditions | | .081 | .186 | .191 | .662 | 1.085 [.753, 1.561] |
| Pain | | .035 | .017 | 4.067 | .044 | 1.035 [1.001, 1.071] |
| Depressive Symptoms | | .208 | .080 | 6.850 | .009 | 1.232 [1.054, 1.439] |
| Social Network | | -.008 | .035 | .052 | .819 | .992 [.925, 1.063] |
| Social Support | | .005 | .020 | .053 | .818 | 1.005 [.966, 1.045] |
| Physical Activity | | -.006 | .005 | 1.387 | .239 | .994 [.985, 1.004] |
| Constant | -3.384 | -2.143 | | | | |
| Nagelkerke R ² | .113 | .253 | | | | |
| <i>Model Coefficient X²</i> | 15.566** | 36.958*** | | | | |

Note. B = effect coefficient, SE = standard error, OR = odd ratio, CI = confident interval, PSQI = Pittsburg Sleep Quality Index, **p* < .05, ** *p* < .01, *** *p* < .001

Table 4.8

Characteristics of Continuous Variables for Participants with Insomnia and without Insomnia

| Variable | No Insomnia (N = 151) | | | Insomnia (N = 29) | | |
|---------------------|-----------------------|-----------|---------------------------|-------------------|-----------|-------------------------|
| | <i>M</i> | <i>SD</i> | Median (Range) | <i>M</i> | <i>SD</i> | Median (Range) |
| Age (year) | 68.87 | 6.42 | 67 (60-92) | 72.17 | 7.13 | 71 (60 – 90) |
| Education (year) | 6.85 | 4.64 | 4 (4 – 22) | 5.03 | 2.57 | 4 (4 – 16) |
| Health Conditions | 1.03 | 0.99 | 1 (0 – 4) | 1.41 | 0.87 | 1 (0 – 3) |
| Pain | 5.12 | 10.35 | 0 (0 – 55.0) | 9.60 | 14 | 0 (0 – 57.5) |
| Depressive Symptoms | 1.60 | 2.03 | 1 (0 – 9) | 3.76 | 2.98 | 4 (0 – 9) |
| Social Network | 19.61 | 5.47 | 20 (3 – 30) | 16.59 | 4.64 | 16 (10 – 28) |
| Social Support | 22.22 | 8.84 | 23 (2 – 44) | 25.62 | 10.19 | 24 (8 – 24) |
| Physical Activity | 85.38 | 43.11 | 79.25 (10.25 – 264.50) | 66.88 | 37.42 | 67.0 (7.25 – 157.75) |
| PSQI | 4.36 | 2.68 | 4 (0 – 13) | 10.48 | 2.87 | 11 (4 – 15) |

Note. PSQI = Pittsburg Sleep Quality Index, M = mean, SD = standard deviation

References

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155-159. Retrieved from <http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf>
- Hosmer, D. W. & Lemeshow, S. (2000). Applied logistic regression. In N. A. C. Cressie, N. I. Fisher, I. M. Johnstone, J. B. Kadane, D. W. Scott, Silverman B. W., A. F. M. Smith, & J. L. Teugels (Eds.), *Special topics* (pp. 260-351). New York: John Wiley & Son, INC.
- Polit, D. F. & Back, C. T. (2004). Nursing research: Principles and methods. In D. F. Polit & C. T., Back (Eds.), *Measurement and data collection* (pp. 317-337). Philadelphia: Lippincott Williams & Wilkins.
- Sperandei, S. (2014). Understanding logistic regression analysis. *Biochemia medica*, 24(1), 12-18. Retrieved from <http://dx.doi.org/10.11613/BM.2014.003>
- Vittinghoff, E., & McCulloch, C. E. (2007). Relaxing the rule of ten events per variable in logistic and Cox regression. *American Journal of Epidemiology*, 165(6), 710-718. doi: 10.1093/aje/kwk052

Chapter Five

Discussion/Conclusions

The purpose of this study was to explore differences in sleep quality among older adults who participated in an exercise session at elder clubs, older adults who performed exercise at home, and older adults who did not exercise, as well as identify factors associated with sleep quality in this population. Findings from this study showed that there were no statistically significant differences in sleep quality scores among the three groups, although the non-exercise group reported scores that indicated poorer sleep quality. Sleep quality had a significant relationship with number of health conditions, pain level, depressive symptoms, social connectedness (social network), and physical activity. In addition, pain and depressive symptoms were significant predictors of sleep quality, when controlling for age, gender, education, and marital status.

This chapter discusses the theoretical framework used in the current study. The findings with respect to the current literature and prior evidence are discussed. This chapter also includes strengths and limitations based on the results of this study. Implications for practice and further research are suggested in this chapter.

The Symptom Management Model and Sleep Quality

The symptom management model was used as a framework to guide this study. This model has been used in other studies to theoretically guide an understanding of relationships among the three major dimensions of the model, including symptom experiences, symptom management strategies, and symptom outcomes in various areas of healthcare (Dodd et.al. 2001; Skelly et al., 2008). This model also provides an understanding of three important contextual factors of person, health and illness, and

environment, all of which can influence symptom management strategies and symptom outcomes. In the current study, exercise habits and physical activity were symptom management strategies and sleep quality was a symptom outcome.

Findings from the current study support the use of the symptom management model that explained a relationship between physical activity and sleep quality and the influence of the contextual factors of person (age), health and illness (health conditions, pain intensity, and depressive symptoms), and environment (social connectedness) on sleep quality. This finding is important to address the multiple aspects related to sleep quality in older population. In addition, this study also provides an understanding of the role of personal, health and illness, and environmental factors on exercise habits (elder club exercise, home exercise, and non-exercise), which guides nursing practice and healthcare providers for developing programs to promote sleep in the Thai older population.

Sleep Quality, Exercise Habits, and Physical Activity

Although no significant differences in sleep quality were found among groups of participants who exercised regularly and those who did not exercise, the overall scores on self-reported physical activity suggested that increasing levels of physical activity had an association with better sleep quality as measured by the PSQI and ISI scores. A possible reason to support this finding could be how the physical activity was measured. In this study, physical activity was measured by all activities related to physical movements that including leisure-time physical activity, occupational physical activity, household physical activity, and transportation physical activity (Fei et al., 2013). Thus, levels of physical activity that participants gained through these activities and not only from

exercise, may affect sleep quality. This finding was parallel with one study that explained a negative relationship of perceived sleep problems with levels of physical activity (Im, Teng, Lee, Kang, Ham, Chee, & Chee, 2014). Besides, a cross-sectional study in a large sample of American older adults has shown health benefits from engaging in more than 300 minutes of lifestyle light-intensity physical activity (e.g., casual walking, stretching, light weight training, dancing slowly, occupation, and light yard work or housework) (Loprinzi, Hyo, & Cardinal, 2015). Since chronic health problems can contribute to sleep disturbances, it is plausible that lifestyle activities as reported in this study could help older adults maintain good sleep.

That there was no significant difference in sleep quality among the three groups of exercise habits (elder club exercise, elder club exercise, non-exercise) could be because other factors besides exercise habits influenced sleep quality of study participants. One possible factor is that reported sleep quality scores in this study may be biased by individuals' sleep perception when that level was measured by self-reported sleep quality, which in this study included the Pittsburg Sleep Quality Index (PSQI) and the Insomnia Severity Index ISI). In fact, older adults perceive poor sleep quality as acceptable, compared with younger age groups (Gooneratne & Vitiello, 2014). However, one cross-sectional study has suggested that older adults tend to report sleep quality worse than is actually the case as evaluated by using subjective versus objective sleep measures (Landry, Best, & Liu-Ambrose, 2015).

Another possibility is that this study recruited healthy older participants or older adults who did not have health conditions that limited their abilities to perform exercise. Strong evidence has emphasized physical health conditions (e.g., pain), and mental

health conditions (e.g., depressive symptoms) as a contributor to poor sleep quality (Ancoli-Israel, 2009; Assantachai et al., 2011; Blågestad et al., 2012; Foley et al., 2004). Yet in this study, the comparison of health conditions among the three groups did not have significant differences. Even though participants reported significant differences in the mean scores on the measures of pain and depressive symptoms across groups, those mean scores were minimal.

Although the difference in sleep quality among the three groups failed to support the hypothesis, this study provided the interesting results in that participants who engaged in an elder club exercise session had better sleep quality scores when compared to those in the home exercise group and the non-exercise group. In this respect, engaging in an exercise session at elder clubs could promote better sleep quality in the Thai older population. According to previous evidence, numerous research studies have confirmed exercise has sleep benefits (Chiu-Yueh & Ai-Fu, 2012; Foley et al., 2004; Holfeld & Ruthig, 2014; Inoue et al., 2013; Mazzotti et al., 2012; Wu et al., 2012). In particular, exercising regularly helped people gain better sleep outcomes, including sleep latency, sleep duration, sleep efficiency, numbers of nighttime awakenings, daytime sleepiness, and overall sleep quality than individuals in control conditions (Kredlow et al., 2015). Kredlow et al. (2015) also concluded that the benefits of exercise for sleep could be recognized after exercise taking place 3 to 8 hours before bedtime, with exercise influencing acute changes on many important aspects of sleep.

Factors Related to Sleep Quality

The present study highlighted that age, number of health conditions, pain intensity and depressive symptoms had significant associations with sleep quality. The results

regarding factors influencing sleep quality found in this study support those of investigators who confirmed that poor sleep quality was common with increasing age and related to physical and mental health problems (Ancoli-Israel, 2005; Crowley, 2011; Foley et al., 2004; Li et al., 2013; Neikrug & Ancoli-Israel, 2010; Ohayon et al., 2004; Rashid et al., 2012). Regarding this aspect, the relationships among pain, depressive symptoms, and sleep quality are bidirectional. In particular, pain can result in poor sleep quality, and in turn, poor sleep quality can lower pain threshold resulting in increased pain sensitivity (Vitiello, et al., 2009). Pain intensity can also be detrimental to mood, which then can amplify sleep difficulties (McMillan et al., 2008). It has been noted that those with a high level of depressive symptoms were more likely to have poorer sleep quality, longer sleep latency, and more nighttime awakenings than those with lower depressive symptoms (Paudel et al., 2008). In turn, poor sleep quality can promote depressive symptoms since clinical research has shown that disturbed REM or non-REM sleep can contribute to maladaptive stress and psychological responses resulting in poor psychological function (Germain, 2013).

This study also provided evidence that social connectedness, especially a social network, was negatively related to the PSQI scores, suggesting that people who had a larger network tend to have better sleep quality. Nevertheless, the result showed a small association of social network with sleep quality. The result of this study reflects the findings of Yao et al. (2008) who found that sleep quality was likely better in older adults with good relationships with family members, relatives, and friends. However, the degree of prediction for sleep quality was not significant in this study. It is possible to note that

the role that social network has in promoting sleep quality may be influenced by other factors that need to be explored.

Literature on social connectedness suggested that number of close friends, frequency of interactions with family and friends or neighbors, trust in neighbors, and level of participation in activities play an important role in supporting well-being and further promote health (Haslam, Cruwys, Haslam, & Jetten, 2015). Moreover, in psychological research, keeping a connection with others can prevent isolation and feeling of loneliness and it can promote a sense of belonging, all of which further benefit physical and emotional well-being (Cornwell & Waite, 2009). Other studies showed that a social network, especially a family network, influenced health-promotion behaviors and further promote perceived healthy aging (Thanakwang & Soonthorndhada, 2011). According to these benefits, the effect of a social network on physical and psychological health may promote good sleep quality.

It is not surprising to note that pain and depressive symptoms significantly predicted sleep quality as measured by the PSQI score after controlling for age, gender, and marital status. It may be because of the participants in this study were mostly healthy and had a few health conditions. Accordingly, the correlations of health conditions as reported by participants with the PSQI score were small in magnitude. This is contrary to what sleep researchers have concluded, which is that the higher prevalence of poor sleepers tends to be found in older adults with high numbers of comorbidities (Ancoli-Israel, 2009; Blågestad et al., 2012; Foley et al., 2004).

Another possible reason for explaining no difference in sleep quality found among the three groups could be that the measure used to record sleep quality lacked the

sensitivity to detect poor sleep quality in cases with low risk and subtle signs of poor sleep, as could be the case with the participants in this study. The PSQI, a subjective sleep measure, is commonly used in research studies as it measures sleep quality and sleep disturbances (Buysse et al., 1989). However, Landry et al. (2015) suggested that the PSQI may not be able to detect subtle but clinically important changes in sleep quality relative to age, health problems, or interventions. Another study showed that the PSQI is limited to detect sleep problems in a low-risk population when compared with polysomnography (Nishiyama et al., 2014). In the present study, however, the PSQI was a better instrument to detect poor sleep quality in Thai older adults when compared with the ISI scale. According to the study's results, the frequency of poor sleepers based on the ISI score was lower than those who reported poor sleep quality on the PSQI score.

One possibility for explaining this difference is that the PSQI and ISI scales measure different aspects of sleep quality. That is, the PSQI measures seven aspects of sleep, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medicine, and daytime dysfunction (Buysse et al., 1989). On the other hand, the ISI measures three dimensions of insomnia, including characteristics of insomnia, severity, and insomnia consequences (Bastien et al., 2001; Morin, Belleville, Bédard, & Ivers, 2011). According to these differences, the ISI is a valid instrument to detect symptoms of insomnia and is sensitive to treatment responses in clinical patients (Morin et al., 2011). In contrast, the PSQI is a valid instrument to capture sleep quality and sleep disturbances (Buysse et al., 1989).

The prediction of sleep quality as measured with the ISI could not be analyzed using logistic regression due to an insufficient number of cases with insomnia. Otherwise,

for participants with scores indicating insomnia and without insomnia, insomnia participants tend to be female, not currently married, and living alone. In addition, their scores indicated poor conditions in health problems, pain, depressive symptom, physical activity, and social network. These findings are useful in promoting sleep awareness among healthcare providers and among older adults and their family members, particularly those with physical and mental problems (e.g., chronic health conditions, , depressive symptoms, and pain), females, and not married or living alone and not connecting with others.

Differences among Groups Relative to Study Variables

This comparison study among three exercise habit groups (elder club exercise, home exercise, and non-exercise) presents three major differences, which support factors influencing symptom management strategies in the symptom management model. These differences include gender, health and illness, and social connectedness. Differences for each variable are discussed below.

Gender differences among groups. The results from this study indicated that fewer older male participants engaged in an exercise session at elder clubs when compared to gender counterparts and other two groups of participants. This study's result supports a previous report about the situations of Thai elder clubs that emphasized that almost all elder club activity attendants were female (Vivatpanich, 2012). It also parallels those of other investigators in the United States and Brazil whose study results suggested that females were more likely to participate in social activities, particularly engaging in more clubs, meeting, and religious activities than did males (Caetano, Silva, & Vettore, 2013; Thomas, 2011).

One possible reason of gender differences in elder club exercise participation found in the current study is the influence of gender roles. Theorists postulate that people are encouraged to conform stereotypic beliefs and behaviors, which could include those indicating that males are stronger and more independent, self-reliant, and robust than females (Courtenay, 2000). Consistent with these gender constructions, men in Thai society are expected to take a role as leaders and earn money to support their families while women are responsible for household activities and play supportive roles for family members. Based on the data from the national survey, more men than women were in the workforce and became the main source of family income among married older adults (Knodel, Prachuabmoh, & Chayavan, 2013). This may further affect available time for older men to participate in elder club activities. In addition, older men engaged in social activities for financial benefits, whereas female elders were more likely to participate in groups or activities that impacted their feelings (Prachuabmoh, 2014). As in this study, it is possible that when social activities (e.g., singing a song, dancing, or playing a game) were added in the club activities along with exercise routines, females had more focused attention in elder club activities than males.

Exercise might be influenced by gender. Guillet, Sarrazin, Fontayne, and Brustad (2006) concluded that people perceived sports or exercise as gender appropriate so that they accept or reject participating in forms of sports or exercise appropriate for their gender. As a result, individuals may have conflicts when engaging in exercise that they perceive inappropriate for their gender. A previous study showed that men were overrepresented in forms of exercise that required strength, speed, and endurance while women were more highly engaged in forms of exercise that required concentration and

calmness (Chalabaev, Sarrazin, Fontayne, Boiché, and Clément-Guillotin, 2013).

Although, little is known about gender appropriateness regarding types of exercise in Thai older population, the results that almost 100% elder club participants were female indicate exercise in the clubs appeals to females.

There were two major differences between elder club exercise and home exercise in the present study regarding forms of exercise and their characteristics. Exercise that older participants performed at elder clubs included Tai Chi plus at least one form of traditional exercise, such as Thai wand exercise, Baslop dance, and Norabic exercise. Although, all of these exercise forms were adjusted according to cultural context and Southern Thai tradition to make it feasible for all older adults to perform, their characteristics, especially for the Baslop dance and Norabic exercise, are a combination form of body-hand movements with traditional music (Kanhachon et al., 2014). Tai Chi focuses concentration on the slow body movements with deep breathing (Lo & Lee, 2014). With all exercise offered in elder clubs, it may be more acceptable for older women than for older men to exercise at elder clubs.

On the other hand, exercise that older participants practiced at home included running, brisk walking, and biking. These exercise characteristics involved speed and consumed high energy. As noted earlier that men seem likely to accept exercise that require strength and speed, more males comprised the home exercise group when compared with the elder club exercise group. It is consistent with one study in Thai older adults that found common types of exercise for male older adults including running, bicycling, and walking but Thai dance and dance with wood stick more common for female elders (Sophonratanapokin, Chaiyawat, & Sawangdee, 2012). Regarding this, the

emphasized forms of exercise that will be integrated into elder club activities is an important issue when designing exercise programs that target male older adults.

Health and illness among groups. The current study also illustrated significant differences in health and illness factors, particularly for pain and depressive symptoms, among participants who engaged in an exercise session at elder club, participants who exercised at home, and participants who did not exercise. These results provide evidence that sedentary older adults are likely to have more physical and mental health conditions, compared with active older adults (de Rezende, Rey-López, Matsudo, & do Carmo Luiz, 2014; Penedo & Dahn, 2005; Teychenne, Ball, & Salmon, 2010). However, health conditions, pain, and depressive symptoms may be factors that cause older participants in this study to not exercise. As such, some literature reviews have shown that poor health is an important barrier to physical activity and exercise among older adults (Boehm et al., 2013; Schutzer & Graves, 2004).

Sedentary lifestyles have been linked to physical and mental health risk factors, while exercising regularly helps to maintain physical and psychological function, prevent diseases, and further improve the quality of life for older adults (Fei et al., 2013; Taylor, 2014). In a large sample of British older adults, low levels of physical activity were significantly associated with cardio-metabolic risk factors that included wrist circumference, body mass index, cholesterol ratio, and Hemoglobin A1c (Stamatakis, Davis, Stathi, & Hamer, 2012). In addition, a longitudinal study on risk factors of depression in older adults suggested that sedentary behaviors were significantly associated with a higher score on the depressive symptoms scales, while participating in high-intensity exercise activities at least once a week were associated with lower

depressive symptoms score (Hamer & Stamatakis, 2014). Hamer and Stamatakis's (2014) results are consistent with the results in the current study that showed a negative correlation between depressive symptoms scores and physical activity levels.

Not only did non-exercise participants have a mean score for pain higher than the other two groups of exercisers, but pain in this study was also negatively correlated with physical activity levels, suggesting that when pain increases, physical activity levels tend to decrease. Pain is an important factor known to cause physical limitations in older adults (Franco et al., 2015; Patel, Guralnik, Dansie, & Turk, 2013). A meta-analysis to compare physical activity between older adults with and without chronic pain suggested a significant lower level of physical activity in older adults with chronic pain (Stubbs et al., 2013). In the current study, participants were asked to report pain that consisted of pain intensity and pain-related to physical function, social function, mood, and sleep. Those who reported a higher score on this measure might be indicating the higher difficulty they encountered while they were performing physical activity and social function due to pain.

Social connectedness among groups. In this study, two concepts were used to identify social connectedness, social network and social support; both of these were found to be significantly different among the three exercise groups. In particular, non-exercisers reported the lower mean score on social network when compared to older participants who engaged in elder club exercise sessions and those who did self-exercise at home. As mentioned by Cornwell et al. (2008), people lose their connections when they get older. Participation in social activities is the way to strengthen social connection among individuals. Research has shown that doing activities that involved interactions with others, such as sports and volunteering work, significantly promoted social

connection (Toepoel, 2013). One of exercise groups in the current study was recruited from elder clubs where seniors in the same communities routinely congregated to perform exercise along with other activities, such as religious activities and potluck events. Thus, through participation in elder club exercise sessions with friends in the group, elder club participants in this study could stay socially connected, and they reported higher social networks than those who were in the non-exercise group.

In this study, the social network for participants in the elder club exercise, however, was lower than that of participants in the home-exercise group. Support for this finding can be found in the way that the elder club exercise groups are structured. In the present study, elder clubs are closed groups that are formed by older adults in communities under the supervision of healthcare providers who are responsible for that area. As a result, participating in elder club's activities allows older adults to interact with friends or neighbors who are elder club members or staff who run elder-club's activities but not others outside the group. Because of this, close connections that elder club members have with other people outside of the group could be limited.

On the other hand, participants in the home exercise group were older adults who performed self-exercise as a regular basis. For example, older adults regularly exercise through walking, running, and biking around their home or other places in communities (e.g., public parks or outdoor stadiums). With places to join in self-exercise around home or public places, older adults performing self-exercise have a likelihood of connecting with a variety of people that provide links to broader connections and different social network types when compared with the elderly who limit themselves at home or are in a specific group, such as an elder club. This reason supports the finding that older

participants in the home-exercise group reported having a greater social network than those in the elder-club group.

Social networks have been noted as an important resource of social support for older adults (Shiovitz-Ezra & Litwin, 2012). This support that individuals receive will take place within their network systems (Ashida & Heaney, 2008). Thus, people who lack social relationships or interact with fewer network members are more likely to receive low social support (Shiovitz-Ezra & Litwin, 2012). According to the British Household Panel Study, older adults who had frequent contacts with other people, interacted frequently with neighbors, and engaged in organizational activities, such as religious activities and sport clubs, constantly perceived that they had high social support (Gray, 2009). Thus, frequent interactions with friends or others through elder club exercise participation or by meeting others while exercising around their houses and public places, as occurred for participants in this study, can help older adults gain more support from others than those who did not.

Although the difference in social support scores were found across the three groups, perceived social support in neither in the elder club exercise group nor in the home exercise group were higher than that for participants in the non-exercise group who had a smaller network size. In addition, the relationship between social support scores and physical activity in this study was not statistically significant. The social support findings in the current study, however, were inconsistent with those of Thanakwang (2008) who suggested that social support significantly influenced health promotion behaviors (e.g., prevention and physical activity). In particular, receiving support from friends or neighbors was the main resource that directly influenced healthy behaviors,

while receiving support from family and relatives mediated healthy behaviors through a sense of well-being (Thanakwang, 2008).

Scores on the social support scale that were higher in the non-exercise group pointed out other factors that may influence perceived social support among the sample of Thai population in this study. Living status and marital status might influence perceived social support in this study as the non-exercise group recruited a higher percentage of participants who were currently married and living with their children, spouse, or partner when compared to the other two groups who did self-exercise and who participated in elder club exercise sessions. According to previous research on British older adults, poor social support has been found in respondents who were childless and have been continually without a partner (Gray, 2009).

Strengths and Limitations

Strengths of the study. Several strengths of the study are addressed, including study design and data collection. For study design, this is the first study that compares sleep quality among different groups of exercise habits, including engaging in an elder club exercise session, performing self-exercise regularly, and not doing exercise. In detail, this study applied habitual interventions as an elder club exercise program and self-exercise that participants currently engage in as part of their daily life to investigate the role that exercise has on influencing sleep quality. Unlike this study, prior research investigated exercise programs for sleep benefits by developing new exercise programs that may be demanding and are not suitable for all older adults. Thus, by investigating the effects of exercise programs that older adults currently engage in, the results are

important and beneficial when looking to promote participation in exercise programs that are already available in communities.

In addition, this study also explored the role of social connectedness on sleep quality. Although the prediction of social connectedness as measured by social network and social support is indefinable, the finding in this study emphasized the differences in social network and social support among groups of elder club exercise, home exercise, and non-exercise. This will guide the future work that can further examine how social connectedness promotes sleep quality. Likewise, data in this study were obtained solely through a questionnaire-face-to-face interview by the principal investigator. During the interview session, participants were allowed time to clarify words or questions if they did not understand. This data collection method prevented missing data and helped with more accurate responses. More importantly, utilizing only one data collector helped assure that data were collected in the same manner, which helped to control data collection biases and maintain the reliability of data collected.

Limitations of the study. Limitations in this study included the cross-sectional design, uncontrolled confounding factors, convenience sampling, and self-report measures. First, convenience sampling resulted in a dominance of female participants. Also, although participants were recruited based on inclusion and exclusion criteria, this selection method could lead to selection biases that recruited participants who overestimated or underestimated their sleep quality. Because the majority of participants in this study were female, it is unclear if the differences of physical activity levels, social connectedness, and sleep quality would be similar for females and males.

Second, this study used a cross-sectional design. With this design, data in this study were collected at only one-time point. The results cannot determine if exercise habits influenced sleep quality, or if sleep quality influenced physical activity. Third, confounding factors related to the differences in sleep quality among groups were not controlled. The finding that shows no differences in sleep quality among groups may be because of the effects from others variables that were found to be significantly different across groups, including age, gender, living status, pain, depressive symptoms, and social connectedness. These confounding factors cannot be controlled by using the Kruskal-Wallis test.

Forth, subjective measures were used to report sleep quality and physical activity levels. Specifically, for self-reported sleep quality, participants in this study were asked to respond the symptoms related to sleep quality that occurred over the past month. Since age relates to a memory decline, self-reported sleep quality can be problematic for cognitively impaired older adults. Although all participants in this study were considered cognitively intact persons, a self-reported sleep quality measure may limit the accuracy of information because, at some point, older adults may not be able to recall all the information. Finally, the interpretation of the study's results should be viewed with caution due to lack of generalization because of the higher number of female participants and the application of a convenience sampling method.

Implications and Future Research

Implications. The findings from the current study could be useful for gerontological nursing practices and other healthcare professionals who are interested in sleep management in community-dwelling older adults. First, the current study provides knowledge on factors contributing to poor sleep quality in older adults. These factors

include not only physio-psychological factors, such as pain and depressive symptoms, but they also include social aspects, particularly an individual's network. This knowledge should be considered when looking into the concept of sleep management. As a result, nursing students and healthcare professionals who are responsible for this population can come to understand multidimensional factors of sleep that will lead to more effective prevention and treatment plans.

Second, this study confirms that the presence of depressive symptoms potentially predicts poor sleep quality in older adults. Most important, depressive symptoms are commonly concurrent with sleep disturbances and pain that link in the same cluster. As a result of this relationship, the study's findings are beneficial for gerontological nurses or other healthcare providers as guidance for setting an advanced care plan or initial interventions that target symptoms within the cluster, as in this case, pain, depressive symptoms, and sleep disturbances.

Third, elder club exercise programs can find more ways to help promote sleep quality in older adults as the sleep quality scores in the elder club exercise group were lower than that of other two groups, indicating the other two groups had poorer sleep. Accordingly, an elder club exercise program can work to enhance sleep quality for Thai older adults as it is a cultural-based program accounting for a Thai context and the needs of people in communities. However, exercise programs should be planned to meet the needs of male older adults as well as females.

Fourth, despite the fact that the magnitude of association of sleep quality with social connectedness, especially for a social network (family and friendship network) was small, building social networks may help with sleep problems in older adults. As the

results in this study indicated that if a social network increases, people tend to have better sleep quality. Although it is unclear that how social network enhances sleep quality, the result is that social networks also link together active older adults. As such, older adults who routinely participate in elder club exercise session or perform self-exercise regularly may explain the social network gained through exercise participation that further promotes their sleep quality.

Last, the current study also confirms that participants who did not exercise reported more health conditions, pain intensity, and depressive symptoms. The physical and mental health conditions that older adults who were inactive in this study faced can point out the need for health professionals, family, and older adults to recognize the factors that can be linked to sleep quality.

Future research. Based on previous evidence and the current study, future research should apply a randomized sampling method and use an objective measure of sleep quality and physical activity. By doing this, researchers can (a) increase the power to detect the differences in sleep quality among older adults with different levels of physical activity, (b) avoid the selection biases that may occur during a recruitment process, and (c) avoid inaccurate data caused by self-report.

A longitudinal and comparison study should be conducted to explore the effect of elder club exercise programs on sleep outcomes in older adults with poor sleep quality in addition to comparing sleep outcomes between older adults who do self-exercise and those who engage in elder club exercise programs. Likewise, how the role of social network is related to exercise participation and influences sleep quality in older adults should be considered.

Finally, future research could utilize a qualitative approach to explore the influence of social connectedness, especially the aspect of social network, on sleep quality in older adults.

Conclusions

The current study provides information that older adults who do not exercise tend to have more health conditions, greater pain intensity, higher depressive symptoms, lower physical activity, and a smaller social network size but also higher social support than older adults who routinely participate in elder club exercise sessions and those who regularly perform self-exercise. Although sleep quality did not appear significantly different across groups, inactive older adults tend to have poorer sleep quality than active older adults. Moreover, age, health conditions, pain, depressive symptoms, physical activity, and social network were associated with sleep quality. The presence of pain and depressive symptoms appear to be important predictors for sleep quality in this population.

References

- Ancoli-Israel, S. (2005). Sleep and aging: prevalence of disturbed sleep and treatment considerations in older adults. *The Journal Of Clinical Psychiatry, 66 Suppl 9*, 24-30. Retrieved from <http://dx.doi.org/10.1097/00019442-200505000-00001>
- Ancoli-Israel, S. (2009). Sleep and its disorders in aging populations [Supplemental material]. *Sleep Medicine, 10*(1), S7-S11. doi: 10.1016/j.sleep.2009.07.004
- Ashida, S., & Heaney, C. A. (2008). Differential associations of social support and social connectedness with structural features of social networks and the health status of older adults. *Journal of Aging & Health, 20*(7), 872-893 822p. Retrieved from <http://jah.sagepub.com/content/20/7/872.full.pdf>
- Assantachai, P., Aekplakorn, W., Pattara-Archachai, J., & Porapakkham, Y. (2011). Factors associated with insomnia in older adults with a mild to moderate degree of poor cognitive ability in Thailand. *Geriatrics & Gerontology International, 11*(1), 16-23. doi:10.1111/j.1447-0594.2010.00627.x
- Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine, 2*(4), 297-307. Retrieved from <https://www.nederlandsautismeregister.nl/assets/Documenten/Bastien%202001%20297%20SIS.pdf>
- Blågestad, T., Pallesen, S., Lunde, L. H., Sivertsen, B., Nordhus, I. H., & Grønli, J. (2012). Sleep in older chronic pain patients: a comparative polysomnographic study. *Clinical Journal of Pain, 28*(4), 277-283. doi: 10.1097/AJP.0b013e3182313899

- Boehm, J., Franklin, R. C., Newitt, R., McFarlane, K., Grant, T., & Kurkowski, B. (2013). Barriers and motivators to exercise for older adults: A focus on those living in rural and remote areas of Australia. *Australian journal of rural health, 21*(3), 141-149. doi: 10.1111/ajr.12032
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193-213. doi:10.1016/0165-1781(89)90047-4
- Caetano, S. C., Silva, C. M., & Vettore, M. V. (2013). Gender differences in the association of perceived social support and social network with self-rated health status among older adults: a population-based study in Brazil. *BMC Geriatr, 13*, 122. doi:10.1186/1471-2318-13-122
- Chalabaev, A., Sarrazin, P., Fontayne, P., Boiché, J., & Clément-Guillotin, C. (2013). The influence of sex stereotypes and gender roles on participation and performance in sport and exercise: Review and future directions. *Psychology of Sport and Exercise, 14*(2), 136-144. <http://dx.doi.org/10.1016/j.psychsport.2012.10.005>
- Chiu-Yueh, Y., & Ai-Fu, C. (2012). Predictors of sleep quality in community-dwelling older adults in Northern Taiwan. *Journal of Nursing Research (Lippincott Williams & Wilkins), 20*(4), 249-259. doi:10.1097/jnr.0b013e3182736461
- Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The social connectedness of older adults: A national profile. *American Sociological Review, 73*(2), 185-203. Retrieved from <http://asr.sagepub.com/content/73/2/185.full.pdf>

- Cornwell, E. Y. & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, *50*(1), 31-48. Retrieved from <http://hsb.sagepub.com/content/50/1/31.full.pdf>
- Courtenay, W. H. (2000). Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Social Science & Medicine*, *50*(10), 1385-1401. Retrieved from [http://dx.doi.org/10.1016/S0277-9536\(99\)00390-1](http://dx.doi.org/10.1016/S0277-9536(99)00390-1)
- Crowley, K. (2011). Sleep and sleep disorders in older adults. *Neuropsychology Review*, *21*(1), 41-53. doi: 10.1007/s11065-010-9154-6
- de Rezende, L. F. M., Rey-López, J. P., Matsudo, V. K. R., & do Carmo Luiz, O. (2014). Sedentary behavior and health outcomes among older adults: a systematic review. *BMC Public Health*, *14*(1), 1-9. Retrived from <http://bmcpublihealth.biomedcentral.com/articles/10.1186/1471-2458-14-333>
- Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J., . . . Taylor, D. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing*, *33*(5), 668-676. doi:10.1046/j.1365-2648.2001.01697.x
- Fei, S., Norman, I. J., & While, A. E. (2013). Physical activity in older adults: A systematic review. *BMC Public Health*, *13*(1), 1-17. doi:10.1186/1471-2458-13-449
- Foley, D., Ancoli-Israel, S., Britz, P., & Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: Results of the 2003 National Sleep Foundation Sleep in America Survey. *Journal of Psychosomatic Research*, *56*(5), 497-502. doi:10.1016/j.jpsychores.2004.02.010

- Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., & Ferreira, M. L. (2015). Older adults's perspectives on participation in physical activity: a systematic review and thematic synthesis of qualitative literature. *British journal of sports medicine*, bjsports-2014-094015. Retrieved from <https://ses.library.usyd.edu.au/bitstream/2123/13701/1/FRANCO%20Marcia%20Rodrigues%20Costa%20-%20Final%20Thesis.pdf#page=46>
- Germain, A. (2013). Sleep disturbances as the hallmark of PTSD: Where are we now? *American Journal of Psychiatr*, 2(4), 403-406. Retrieved from https://www.researchgate.net/profile/Anne_Germain/publication/6280355_Effects_of_a_brief_behavioral_treatment_for_late-life_insomnia_preliminary_findings/links/0912f50de09f9bf358000000.pdf
- Gooneratne, N. S., & Vitiello, M. V. (2014). Sleep in older adults: normative changes, sleep disorders, and treatment options. *Clinics in Geriatric Medicine*, 30(3), 591-627. doi:10.1016/j.cger.2014.04.007
- Gray, A. (2009). The social capital of older adults. *Ageing and Society*, 29(01), 5-31. Retrieved from <http://dx.doi.org/10.1017/S0144686X08007617>
- Guillet, E., Sarrazin, P., Fontayne, P., & Brustad, R. J. (2006). Understanding female sport attrition in a stereotypical male sport within the framework of Eccles's Expectancy–Value model. *Psychology of Women Quarterly*, 30(4), 358-368. Retrieved from <http://pwq.sagepub.com/content/30/4/358.full>
- Hamer, M., & Stamatakis, E. (2014). Prospective study of sedentary behavior, risk of depression, and cognitive impairment. *Medicine and science in sports and exercise*, 46(4), 718. doi: 10.1249/MSS.0000000000000156

- Haslam, C., Cruwys, T., Haslam, S. A., & Jetten, J. (2015). Social connectedness and health. *Encyclopaedia of Geropsychology*, 46-41. doi 10.1007/978-981-287-080-3_46-1
- Holfeld, B., & Ruthig, J. C. (2014). A Longitudinal examination of sleep quality and physical activity in older adults. *Journal of Applied Gerontology*, 33(7), 791-807. doi:10.1177/0733464812455097
- Im, E. O., Teng, H., Lee, Y., Kang, Y., Ham, O. K., Chee, E., & Chee, W. (2014). Physical activities and sleep-related symptoms in 4 major racial/ethnic groups of midlife women. *Family & community health*, 37(4), 307-316. doi: 10.1097/FCH.0000000000000041
- Inoue, S., Yorifuji, T., Sugiyama, M., Ohta, T., Ishikawa-Takata, K., & Doi, H. (2013). Does habitual physical activity prevent insomnia? A cross-sectional and longitudinal study of elderly Japanese. *Journal of Aging & Physical Activity*, 21(2), 119-139. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=S&aulast=Inoue&atitle=Does+habitual+physical+activity+prevent+insomnia%3F+A+cross-sectional+and+longitudinal+study+of+elderly+Japanese&title=Journal+of+aging+and+physical+activity&volume=21&issue=2&date=2013&sp>
- Kanhachon, W., Boonprakob, Y., Wanpen, S., & Boontha, K. (2014). Comparative effect of Paslop dancing and specific core stabilizing exercise on postural control and core strength in sedentary subjects. *Bulletin of Chiang Mai Associated Medical Sciences*, 47(3), 143. Retrieved from file:///C:/Users/cp98f/Downloads/197-400-1-SM.pdf

- Knodel, J., Prachuabmoh, V., & Chayavan, N. (2013). *The changing of well-being of Thai elderly: An update from the 2011 Survey of older adults in Thailand*. Institute for Social Research. University of Michigan. Retrived from <http://www.psc.isr.umich.edu/pubs/pdf/rr13-793.pdf>
- Kredlow, M., Capozzoli, M., Hearon, B., Calkins, A., & Otto, M. (2015). The effects of physical activity on sleep: a meta-analytic review. *Journal of Behavioral Medicine, 38*(3), 427-449. doi:10.1007/s10865-015-9617-6
- Landry, G. J., Best, J. R., & Liu-Ambrose, T. (2015). Measuring sleep quality in older adults: a comparison using subjective and objective methods. *Frontiers in aging neuroscience, 7*. doi: 10.3389/fnagi. 2015.00166
- Li, Yao, Y. S., Dong, Q., Dong, Y. H., Liu, J. J., Yang, L. S., & Huang, F. (2013). Characterization and factors associated with sleep quality among rural elderly in China. *Arch Gerontol Geriatr, 56*(1), 237-243. doi:10.1016/j.archger.2012.08.002
- Lo, C. M.-H., & Lee, P. H. (2014). Feasibility and effects of Tai Chi for the promotion of sleep quality and quality of life. *Journal of Gerontological Nursing, 40*(3), 46-52. doi:10.3928/00989134-20131028-08
- Loprinzi, P. D., Hyo, L., & Cardinal, B. J. (2015). Evidence to support including lifestyle light-intensity recommendations in physical activity guidelines for older adults. *American Journal of Health Promotion, 29*(5), 277-284. doi: 10.1016/j.mhpa.2011.08.001
- Mazzotti, D. R., Guindalini, C., Sosa, A. L., Ferri, C. P., & Tufik, S. (2012). Prevalence and correlates for sleep complaints in older adults in low and middle income

countries: A 10/66 Dementia Research Group study. *Sleep Medicine*, 13(6), 697-702. doi:10.1016/j.sleep.2012.02.009

McMillan, S. C., Tofthagen, C., & Morgan, M. A. (2008). Relationships among pain, sleep disturbances, and depressive symptoms in outpatients from a comprehensive cancer center. *Journal of Oncology Nursing Forum*, 35(4), 603 - 611. doi:10.1188/08.ONF.603-611

Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep: Journal of Sleep and Sleep Disorders Research*, 34(5), 601-608. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3079939/pdf/aasm.34.5.601.pdf>

Neikrug, A. B., & Ancoli-Israel, S. (2010). Sleep disorders in the older adult—A mini-review. *Gerontology*, 56(2), 181-189. doi: 10.1159/000236900

Nishiyama, T., Mizuno, T., Kojima, M., Suzuki, S., Kitajima, T., Ando, K. B., . . .

Nakayama, M. (2014). Criterion validity of the Pittsburgh Sleep Quality Index and Epworth Sleepiness Scale for the diagnosis of sleep disorders. *Sleep Medicine*, 15(4), 422-429. doi:10.1016/j.sleep.2013.12.015

Ohayon, M. M., Carskadon, M. A., Guilleminault, C., & Vitiello, M. V. (2004). Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: Developing normative sleep values across the human lifespan. *Sleep: Journal of Sleep and Sleep Disorders Research*, 27(7), 1255-1273. Retrieved from https://www.researchgate.net/profile/Michael_Vitiello/publication/8140802_Meta-analysis_of_quantitative_sleep_parameters_from_childhood_to_old_age

[_in_healthy_individuals_Developing_normative_sleep_values_across_the_human_lifespan_Sleep_27_1255-1274/links/02bfe51226d35f28b1000000.pdf](#)

- Patel, K. V., Guralnik, J. M., Dansie, E. J., & Turk, D. C. (2013). Prevalence and impact of pain among older adults in the United States: Findings from the 2011 National Health and Aging Trends Study. *PAIN®*, *154*(12), 2649-2657. Retrieved from <http://dx.doi.org/10.1016/j.pain.2013.07.029>
- Paudel, M. L., Taylor, B. C., Diem, S. J., Stone, K. L., Ancoli-Israel, S., Redline, S., & Ensrud, K. E. (2008). Association between depressive symptoms and sleep disturbances in community-dwelling older men. *Journal of the American Geriatrics Society*, *56*(7), 1228-1235. doi:10.1111/j.1532-5415.2008.01753.x
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current opinion in psychiatry*, *18*(2), 189-193. Retrieved from <http://dx.doi.org/10.1097/00001504-200503000-00013>
- Prachuabmoh, V. (2014). Gender and ageing: Southeast Asian perspectives. In T. W. Devasahayam (Ed.), *Gender and ageing Southeast Asian perspectives* (pp. 99 - 121). Singapore: ISEAS publishing.
- Rashid, A., Ong, E. K., & Eleanor Shu Yi, W. (2012). Sleep quality among residents of an old folk's home in Malaysia. *Iranian Journal of Nursing & Midwifery Research*, *17*(7), 512-519. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3730455/?report=printable>
- Schutzer, K. A., & Graves, B. S. (2004). Barriers and motivations to exercise in older adults. *Preventive medicine*, *39*(5), 1056-1061. doi: 10.1016/j.ypmed.2004.04.003

- Shiovitz-Ezra, S., & Litwin, H. (2012). Social network type and health-related behaviors: evidence from an American national survey. *Social Science & Medicine*, 75(5), 901-904. doi: 10.1016/j.socscimed.2012.04.031
- Skelly, A. H., Leeman, J., Carlson, J., Soward, A. C. M., & Burns, D. (2008). Conceptual model of symptom-focused diabetes care for African Americans. *Journal of Nursing Scholarship*, 40(3), 261-267 267p. doi:10.1111/j.1547-5069.2008.00236.x
- Sophonratanapokin, B., Chaiyawat, P., & Sawangdee, Y. (2012). Reasons of exercise and no-exercise in the young-old elderly in Tambon Salaya, Nakhon Pathom. *Thammasat Medical Journal-ธรรมศาสตร์ เวช สาร*, 11(2), 137-146. Retrieved from <http://thailand.digitaljournals.org/index.php/TMJ/article/viewFile/9513/9359>
- Stamatakis, E., Davis, M., Stathi, A., & Hamer, M. (2012). Associations between multiple indicators of objectively-measured and self-reported sedentary behaviour and cardiometabolic risk in older adults. *Preventive Medicine*, 54(1), 82-87. Retrieved from <http://dx.doi.org/10.1016/j.ypmed.2011.10.009>
- Stubbs, B., Binnekade, T. T., Soundy, A., Schofield, P., Huijnen, I. P., & Eggermont, L. H. (2013). Are older adults with chronic musculoskeletal pain less active than older adults without pain? A systematic review and meta-analysis. *Pain Medicine*, 14(9), 1316-1331. doi: 10.1111/pme.12154
- Taylor, D. (2014). Physical activity is medicine for older adults. *Postgraduate medical journal*, 90(1059), 26-32. doi: 10.1136/postgradmedj-2012-131366

- Teychenne, M., Ball, K., & Salmon, J. (2010). Sedentary behavior and depression among adults: a review. *International journal of behavioral medicine*, 17(4), 246-254.
doi: 10.1007/s12529-010-9075-z
- Thanakwang, K. (2008). Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Thai Journal of Nursing Research*, 12(4), 243-258. Retrieved from http://www.tnc.or.th/files/2011/05/tnc_journal-631/thai_journal_of_nursing_research_vol_12_no_4_oct_33974.pdf.
- Thanakwang, K., & Soonthornhdada, K. (2011). Mechanisms by which social support networks influence healthy aging among Thai community-dwelling elderly. *Journal of Aging & Health*, 23(8), 1352-1378. doi:10.1177/0898264311418503
- Toepoel, V. (2013). Ageing, leisure, and social connectedness: How could leisure help reduce isolation of older adults? *Social Indicators Research*, 113(1), 355-372.
doi:10.1007/s11205-012-0097-6
- Vitiello, M. V., Rybarczyk, B., Von Korff, M., & Stepanski, E. J. (2009). Cognitive behavioral therapy for insomnia improves sleep and decreases pain in older adults with co-morbid insomnia and osteoarthritis. *Journal of Clinical Sleep Medicine*, 5(4), 355-362. doi: 10.1111/jgs.12275
- Viwatpanich, K. (2012). Situation and direction of research-thesis in elder club in Thailand. *Thammasat Medical Journal*, 12(2), 331-337. Retrieved from <http://www.tci-thaijo.org/index.php/tmj/article/view/14026/12759>
- Wu, C. Y., Su, T. P., Fang, C. L., & Yeh Chang, M. (2012). Sleep quality among community-dwelling elderly people and its demographic, mental, and physical correlates. *J Chin Med Assoc*, 75(2), 75-80. doi:10.1016/j.jcma.2011.12.011

Yao, K., Yu, S., Cheng, S., & Chen, I. (2008). Relationships between personal, depression and social network factors and sleep quality in community-dwelling older adults. *Journal of Nursing Research (Taiwan Nurses Association)*, 16(2), 131-138. doi: 10.1097/01.JNR.0000387298.37419.ff

REFERENCES

- Agresti, A. & Finlay, B. (2009). Statistical methods for the social sciences. In D. Lynch (Ed.), *Analyzing association between categorical variables* (pp. 221-241). New Jersey: Prentice Hall, Inc.
- Ailshire, J. A., & Burgard, S. A. (2012). Family relationships and troubled sleep among US adults examining the influences of contact frequency and relationship quality. *Journal of Health and Social Behavior*, 53(2), 248-262. doi: 10.1177/0022146512446642
- Ait-Aoudia, M., Levy, P. P., Bui, E., Insana, S., de Fouchier, C., Germain, A., & Jehel, L. (2013). Validation of the French version of the Pittsburgh Sleep Quality Index Addendum for posttraumatic stress disorder. *European Journal of Psychotraumatology*, 4, 1-8. doi:10.3402/ejpt.v4i0.19298
- Alessi, C., & Vitiello, M. V. (2011). Insomnia (primary) in older adults. *BMJ Clinical Evidence*, 2011. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275108/>
- Alsaadi, S. M., McAuley, J. H., Hush, J. M., Lo, S., Lin, C. W. C., Williams, C. M., & Maher, C. G. (2014). Poor sleep quality is strongly associated with subsequent pain intensity in patients with acute low back pain. *Arthritis & Rheumatology*, 66(5), 1388-1394. doi: 10.1002/art.38329
- Ancoli-Israel, S. (2005). Sleep and aging: prevalence of disturbed sleep and treatment considerations in older adults (Supplemental material]. *The Journal Of Clinical Psychiatry*, 66 (9), 24-30. Retrieved from <http://dx.doi.org/10.1097/00019442-200505000-00001>

- Ancoli-Israel, S. (2009). Sleep and its disorders in aging populations[Supplemental material]. *Sleep Medicine*, *10*(1), S7-S11. doi: 10.1016/j.sleep.2009.07.004
- Arber, S., Bote, M., & Meadows, R. (2009). Gender and socio-economic patterning of self-reported sleep problems in Britain. *Social Science & Medicine*, *68*(2), 281-289. doi: 10.1016/j.socscimed.2008.10.016
- Arora, V. M., Chang, K. L., Fazal, A. Z., Stasiunas, P. G., Meltzer, D. O., Zee, P. C., . . . Van Cauter, E. (2011). Objective sleep duration and quality in hospitalized older adults: Associations with blood pressure and mood. *Journal of the American Geriatrics Society*, *59*(11), 2185-2186. doi:10.1111/j.1532-5415.2011.03644.x
- Ashida, S., & Heaney, C. A. (2008). Differential associations of social support and social connectedness with structural features of social networks and the health status of older adults. *Journal of Aging & Health*, *20*(7), 872-893 822p. Retrieved from <http://jah.sagepub.com/content/20/7/872.full.pdf>
- Assantachai, P., Aekplakorn, W., Pattara-Archachai, J., & Porapakkham, Y. (2011). Factors associated with insomnia in older adults with a mild to moderate degree of poor cognitive ability in Thailand. *Geriatrics & Gerontology International*, *11*(1), 16-23. doi:10.1111/j.1447-0594.2010.00627.x
- Baron, K. G., Reid, K. J., & Zee, P. C. (2013). Exercise to improve sleep in insomnia: exploration of the bidirectional effects. *Journal Of Clinical Sleep Medicine: JCSM: Official Publication Of The American Academy Of Sleep Medicine*, *9*(8), 819-824. doi:10.5664/jcsm.2930
- Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*(4), 297-

307. Retrieved from <https://www.nederlandsautismeregister.nl/assets/Documenten/Bastien%202001%20297%20SIS.pdf>

Beckett, M., Goldman, N., Weinstein, M., Lin, I., & Chuang, Y. (2002). Social environment, life challenge, and health among the elderly in Taiwan. *Social Science & Medicine*, 55(2), 191-209 119p. Retrieved from http://ac.els-cdn.com/S0277953601001617/1-s2.0-S0277953601001617-main.pdf?_tid=7be90832-88d1-11e6-a866-00000aab0f02&acdnat=1475434579_2c8f0bde17ef52b5383e53b5a8af9144

Belza, B. and the Prevention Research Centers-Healthy Aging Research Network Physical Activity Conference Planning Workgroup (2007). *Moving ahead: Strategies and tools to plan, conduct, and maintain effective community-based physical activity programs for older adults*. Centers for Disease Control and Prevention: Atlanta, Georgia. Retrieved from http://www.cdc.gov/aging/pdf/community-based_physical_activity_programs_for_older_adults.pdf

Bertolazi, A. N., Fagondes, S. C., Hoff, L. S., Dartora, E. G., da Silva Miozzo, I. C., de Barba, M. E. F., & Barreto, S. S. M. (2011). Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. *Sleep Medicine*, 12(1), 70-75. doi:10.1016/j.sleep.2010.04.020

Binhosen, V., Panuthai, S., Srisuphun, W., Chang, E., Sucamvang, K., & Cioffi, J. (2003). Physical activity and health related quality of life among the urban Thai elderly. *Thai Journal of Nursing Research*, 7(4), 231-243. Retrieved from https://www.researchgate.net/profile/Jane_Cioffi/publication/224670414_Physical

_activity_and_health_related_quality_of_life_among_the_urban_Thai_elderly/links/0fcfd50500d8637f5a000000.pdf

- Blågestad, T., Pallesen, S., Lunde, L. H., Sivertsen, B., Nordhus, I. H., & Grønli, J. (2012). Sleep in older chronic pain patients: a comparative polysomnographic study. *Clinical Journal of Pain, 28*(4), 277-283. doi: 10.1097/AJP.0b013e3182313899
- Bloch, A. H. (2014). *The effect of exercise on self-reported sleep quality in older adults with cognitive complaints*. (74), ProQuest Information & Learning, US. Retrieved from <http://proxy.mul.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2014-99020-148&site=ehost-live> Available from EBSCOhost psyh database.
- Blozik, E., Stuck, A. E., Niemann, S., Ferrell, B. A., Harari, D., Renteln-Kruse, W., . . . Clough-Gorr, K. M. (2007). Geriatric pain measure short form: development and initial evaluation. *Journal of the American Geriatrics Society, 55*(12), 2045-2050 2046p. doi:10.1111/j.1532-5415.2007.01474.x
- Boehm, J., Franklin, R. C., Newitt, R., McFarlane, K., Grant, T., & Kurkowski, B. (2013). Barriers and motivators to exercise for older adults: A focus on those living in rural and remote areas of Australia. *Australian journal of rural health, 21*(3), 141-149. doi: 10.1111/ajr.12032
- Brown, R. E., Basheer, R., McKenna, J. T., Strecker, R. E., & McCarley, R. W. (2012). Control of sleep and wakefulness. *Physiol Rev, 92*(3), 1087-1187. doi: 10.1152/physrev.00032.2011

- Buckley, C., & McCarthy, G. (2009). An exploration of social connectedness as perceived by older adults in a long-term care setting in Ireland. *Geriatric Nursing, 30*(6), 390-396. doi:10.1016/j.gerinurse.2009.09.001
- Buman, M. P., Hekler, E. B., Bliwise, D. L., & King, A. C. (2011). Moderators and mediators of exercise-induced objective sleep improvements in midlife and older adults with sleep complaints. *Health Psychology, 30*(5), 579-587. doi: 10.1037/a0024293
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2), 193-213. doi:10.1016/0165-1781(89)90047-4
- Caetano, S. C., Silva, C. M., & Vettore, M. V. (2013). Gender differences in the association of perceived social support and social network with self-rated health status among older adults: a population-based study in Brazil. *BMC Geriatr, 13*, 122. doi:10.1186/1471-2318-13-122
- Carlson, S. A., Fulton, J. E., Schoenborn, C. A., & Loustalot, F. (2010). Trend and prevalence estimates based on the 2008 Physical Activity Guidelines for Americans. *American Journal Of Preventive Medicine, 39*(4), 305-313. doi:10.1016/j.amepre.2010.06.006
- Carroll, J. E., Seeman, T. E., Olmstead, R., Melendez, G., Sadakane, R., Bootzin, R., . . . Irwin, M. R. (2015). Improved sleep quality in older adults with insomnia reduces biomarkers of disease risk: Pilot results from a randomized controlled

comparative efficacy trial. *Psychoneuroendocrinology*, 55, 184-192.

doi:10.1016/j.psyneuen.2015.02.010

Centers for Disease Control and Prevention (2011). Effect of short sleep duration on daily activities--United States, 2005-2008. *MMWR. Morbidity and Mortality Weekly Report*, 60(8), 239-242. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6008a3.htm>

Chalabaev, A., Sarrazin, P., Fontayne, P., Boiché, J., & Clément-Guillotin, C. (2013).

The influence of sex stereotypes and gender roles on participation and performance in sport and exercise: Review and future directions. *Psychology of Sport and Exercise*, 14(2), 136-144. Retrieved from <http://dx.doi.org/10.1016/j.psychsport.2012.10.005>

Chaudhury, H., Campo, M., Michael, Y., & Mahmood, A. (2016). Neighbourhood environment and physical activity in older adults. *Social Science & Medicine*, 149, 104-113. <http://dx.doi.org/10.1016/j.socscimed.2015.12.011>

Chen, J.-H., Lauderdale, D. S., & Waite, L. J. (2016). Social participation and older adults' sleep. *Social Science & Medicine*, 149, 164-173. Retrieved from <http://dx.doi.org/10.1016/j.socscimed.2015.11.045>

Chen, J.-H., Waite, L. J., Kurina, L. M., Thisted, R. A., McClintock, M., & Lauderdale, D. S. (2015). Insomnia symptoms and actigraph-estimated sleep characteristics in a nationally representative sample of older adults. *The Journals of Gerontology: Series A: Biological Sciences and Medical Sciences*, 70A(2), 185-192.

doi:10.1093/gerona/glu144

- Chen, J.-H., Waite, L. J., & Lauderdale, D. S. (2015). Marriage, relationship quality, and sleep among US older adults. *Journal of Health and Social Behavior*, 1-20. doi: 10.1177/0022146515594631
- Chen, Q., Hayman, L. L., Shmerling, R. H., Bean, J. F., & Leveille, S. G. (2011). Characteristics of chronic pain associated with sleep difficulty in older adults: The maintenance of balance, Independent Living, Intellect, and Zest in the Elderly (MOBILIZE) Boston Study. *Journal of the American Geriatrics Society*, 59(8), 1385-1392. doi:10.1111/j.1532-5415.2011.03544.x
- Chennaoui, M., Arnal, P. J., Sauvet, F., & Léger, D. (2015). Sleep and exercise: A reciprocal issue? *Sleep Medicine Reviews*, 20, 59-72. doi:10.1016/j.smr.2014.06.008
- Chiu-Yueh, Y., & Ai-Fu, C. (2012). Predictors of sleep quality in community-dwelling older adults in Northern Taiwan. *Journal of Nursing Research (Lippincott Williams & Wilkins)*, 20(4), 249-259. doi:10.1097/jnr.0b013e3182736461
- Chong, L., Zhen-Ying, W., & Chang-Jun, Z. (2005). Sleep problem and related factors of elderly in Xinxiang. *Chinese Mental Health Journal*, 19(11), 755-757. Abstract retrieved from <http://proxy.mul.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2005-15454-010&site=ehost-live> smyjsf2fy@xxmc.edu.cn
- Chung, K. F. (2005). Insomnia subtypes and their relationships to daytime sleepiness in patients with obstructive sleep apnea. *Respiration*, 72(5), 460-465. doi: 10.1159/000087668

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155-159. Retrieved from <http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf>
- Colten, H. R. & Bruce M. A. (2006). *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Institutional of Medicine of the National Academies. Washington, DC: The National Academies Press. Retrieved from <https://docs.wind-watch.org/Sleep-Disorders-Sleep-Deprivation.pdf>
- Cornwell, B., & Laumann, E. O. (2015). The health benefits of network growth: New evidence from a national survey of older adults. *Social Science & Medicine*, 125, 94-106. doi:10.1016/j.socscimed.2013.09.011
- Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The social connectedness of older adults: A national profile. *American Sociological Review*, 73(2), 185-203. Retrieved from <http://asr.sagepub.com/content/73/2/185.full.pdf>
- Cornwell, E. Y. & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, 50(1), 31-48. Retrieved from <http://hsb.sagepub.com/content/50/1/31.full.pdf>
- Costa, S. V., Ceolim, M. F., & Neri, A. L. (2011). Sleep problems and social support: Frailty in a Brazilian elderly multicenter study. *Revista Latino-Americana de Enfermagem (RLAE)*, 19(4), 920-927. doi:10.1590/S0104-11692011000400010
- Courtenay, W. H. (2000). Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Social Science & Medicine*, 50(10), 1385-1401. Retrieved from [http://dx.doi.org/10.1016/S0277-9536\(99\)00390-1](http://dx.doi.org/10.1016/S0277-9536(99)00390-1)
- Cricco, M., Simonsick, E. M., & Foley, D. J. (2001). The impact of insomnia on cognitive functioning in older adults. *Journal of the American Geriatrics Society*,

49(9), 1185-1189. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1046/j.1532-5415.2001.49235.x/full>

Crowley, K. (2011). Sleep and sleep disorders in older adults. *Neuropsychology Review*, 21(1), 41-53. doi: 10.1007/s11065-010-9154-6

Curcio, G., Tempesta, D., Scarlata, S., Marzano, C., Moroni, F., Rossini, P., . . . Gennaro, L. (2013). Validity of the Italian Version of the Pittsburgh Sleep Quality Index (PSQI). *Neurological Sciences*, 34(4), 511-519. doi:10.1007/s10072-012-1085-y

de Rezende, L. F. M., Rey-López, J. P., Matsudo, V. K. R., & do Carmo Luiz, O. (2014). Sedentary behavior and health outcomes among older adults: a systematic review. *BMC Public Health*, 14(1), 1-9. Retrived from <http://bmcpublikealth.biomedcentral.com/articles/10.1186/1471-2458-14-333>

Deratnay, P., & Sidani, S. (2013). The effect of insomnia on functional status of community-dwelling older adults. *Journal of Gerontological Nursing*, 39(10), 22-30. doi:10.3928/00989134-20130909-99

Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J., . . . Taylor, D. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing*, 33(5), 668-676. doi:10.1046/j.1365-2648.2001.01697.x

Du, S., Dong, J., Zhang, H., Jin, S., Xu, G., Liu, Z., . . . Sun, Z. (2015). Tai chi exercise for self-rated sleep quality in older adults: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 52(1), 368-379. doi:10.1016/j.ijnurstu.2014.05.009

Dzierzewski, J. M., Mitchell, M., Rodriguez, J. C., Fung, C. H., Jouldjian, S., Alessi, C. A., & Martin, J. L. (2015). Patterns and predictors of sleep quality before, during,

- and after hospitalization in older adults. *Journal Of Clinical Sleep Medicine: JCSM: Official Publication Of The American Academy Of Sleep Medicine*, 11(1), 45-51. doi:10.5664/jcsm.4362
- Erlacher, C., Erlacher, D., & Schredl, M. (2015). The effects of exercise on self-rated sleep among adults with chronic sleep complaints. *Journal of Sport and Health Science*, 4(3), 289-298. doi:10.1016/j.jshs.2014.01.001
- Espiritu, J. R. D. (2008). Aging-related sleep changes. *Clinics in Geriatric Medicine*, 24(1), 1-14 14p. doi: 10.1016/j.cger.2007.08.007
- Fei, S., Norman, I. J., & While, A. E. (2013). Physical activity in older adults: a systematic review. *BMC Public Health*, 13(1), 1-17. doi:10.1186/1471-2458-13-449
- Ferrell, B. A., Stein, W. M., & Beck, J. C. (2000). The Geriatric Pain Measure: validity, reliability and factor analysis. *Journal of the American Geriatrics Society*, 48(12), 1669-1673. doi: 10.1111/j.1532-5415.2000.tb03881.x
- Flausino, N. H., Da Silva Prado, J. M., De Queiroz, S. S., Tufik, S., & De Mello, M. T. (2012). Physical exercise performed before bedtime improves the sleep pattern of healthy young good sleepers. *Psychophysiology*, 49(2), 186-192. doi:10.1111/j.1469-8986.2011.01300.x
- Foley, D., Ancoli-Israel, S., Britz, P., & Walsh, J. (2004). Sleep disturbances and chronic disease in older adults: Results of the 2003 National Sleep Foundation Sleep in America Survey. *Journal of Psychosomatic Research*, 56(5), 497-502. doi:10.1016/j.jpsychores.2004.02.010

- Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., & Ferreira, M. L. (2015). Older adults's perspectives on participation in physical activity: a systematic review and thematic synthesis of qualitative literature. *British journal of sports medicine*, bjsports-2014-094015. Retrieved from <https://ses.library.usyd.edu.au/bitstream/2123/13701/1/FRANCO%20Marcia%20Rodrigues%20Costa%20-%20Final%20Thesis.pdf#page=46>
- Gagnon, C., Bélanger, L., Ivers, H., & Morin, C. M. (2013). Validation of the Insomnia Severity Index in primary care. *Journal Of The American Board Of Family Medicine: JABFM*, 26(6), 701-710. doi:10.3122/jabfm.2013.06.130064
- Galloway, A. P. (2013). *Relationships between social connectedness and spirituality on development of depression and perceived health status in rural populations*. (Ph.D.), University of Northern Colorado. Retrieved from <http://proxy.mul.missouri.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,cookie,url,uid&db=cin20&AN=2012566552&site=ehost-live&scope=site> Available from EBSCOhost cin20 database.
- Gebhart, C., Erlacher, D., & Schredl, M. (2011). Moderate exercise plus sleep education improves self-reported sleep quality, daytime mood, and vitality in adults with chronic sleep complaints: a waiting list-controlled trial. *Sleep Disorders*, 2011, 809312-809312. doi:10.1155/2011/809312
- Germain, A. (2013). Sleep disturbances as the hallmark of PTSD: Where are we now? *American Journal of Psychiatr*, 2(4), 403-406. Retrieved from https://www.researchgate.net/profile/Anne_Germain/publication/6280355_Effects

[_of_a_brief_behavioral_treatment_for_late-life_insomnia_preliminary_findings/links/0912f50de09f9bf358000000.pdf](#)

- Gooneratne, N. S., & Vitiello, M. V. (2014). Sleep in older adults: normative changes, sleep disorders, and treatment options. *Clinics in Geriatric Medicine, 30*(3), 591-627. doi:10.1016/j.cger.2014.04.007
- Gottlieb, D. J., Punjabi, N. M., Newman, A. B., Resnick, H. E., Redline, S., Baldwin, C. M., & Nieto, F. J. (2005). Association of sleep time with diabetes mellitus and impaired glucose tolerance. *Archives of Internal Medicine, 165*(8), 863-868. Retrieved from <http://archinte.jamanetwork.com/article.aspx?articleid=486518&=rssa>
- Gray, A. (2009). The social capital of older adults. *Ageing and Society, 29*(01), 5-31. Retrieved from <http://dx.doi.org/10.1017/S0144686X08007617>
- Guillet, E., Sarrazin, P., Fontayne, P., & Brustad, R. J. (2006). Understanding female sport attrition in a stereotypical male sport within the framework of Eccles's Expectancy-Value model. *Psychology of Women Quarterly, 30*(4), 358-368. Retrieved from <http://pwq.sagepub.com/content/30/4/358.full>
- Haight, T., Tager, I., Sternfeld, B., Satariano, W., & van der Laan, M. (2005). Effects of body composition and leisure-time physical activity on transitions in physical functioning in the elderly. *American Journal of Epidemiology, 162*(7), 607-617. doi: 10.1093/aje/kwi254
- Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: surveillance progress, pitfalls, and

prospects. *Lancet*, 380(9838), 247-257. Retrieved from
[http://dx.doi.org/10.1016/S0140-6736\(12\)60646-1](http://dx.doi.org/10.1016/S0140-6736(12)60646-1)

Hamer, M., & Stamatakis, E. (2014). Prospective study of sedentary behavior, risk of depression, and cognitive impairment. *Medicine and science in sports and exercise*, 46(4), 718. doi: 10.1249/MSS.0000000000000156

Hang, G. A. O., & Jiaojiao, S. H. I. (2013). Effects of aerobic exercise on sleep quality of older adults with sleep disorders. *Journal of Shenyang Institute of Physical Education*, 32(2), 93-95. Abstract retrieved from <http://epub.cnki.net/grid2008/download.aspx?filename=ZpWeBlVR1g1KstmcBxUZw0UYLF1a2gnVz0UUZRmVqp3Z6xkS5BzRzhGUBZUNrBTVwZ2Q2h0UxBnSwFFeal1Ky1kTuVDOaJvc3Y0Y5R1b5NnVoBTert2MopWSWhHbL1GV4cnMaRFSyoGe3I2b0M0TyNVaZRUSC5mZ&tablename=CJFD2013&dflag=pdfdown>

Hanson, B. L., & Ruthig, J. C. (2012). The unique role of sleep quality in older adults' psychological well-being. *Journal of Applied Gerontology*, 31(5), 587-607.
doi:10.1177/0733464810392226

Hara, C., Stewart, R., Lima-Costa, M. F., Rocha, F. L., Fuzikawa, C., Uchoa, E., . . . Castro-Costa, É. (2011). Insomnia subtypes and their relationship to excessive daytime sleepiness in Brazilian community-dwelling older adults. *Sleep: Journal of Sleep and Sleep Disorders Research*, 34(8), 1111-1117. doi: 10.5665/SLEEP.1172

Harvey, A. G., Stinson, K., Whitaker, K. L., Moskowitz, D., & Virk, H. (2008). The subjective meaning of sleep quality: A comparison of individuals with and without insomnia. *Sleep: Journal of Sleep and Sleep Disorders Research*, 31(3),

383-393. Retrieved from https://www.researchgate.net/profile/Damian_Moskovitz/publication/5489713_The_subjective_meaning_of_sleep_quality_a_comparison_of_individuals_with_and_without_insomnia/links/02e7e53c61f4564bb0000000.pdf

Haslam, C., Cruwys, T., Haslam, S. A., & Jetten, J. (2015). Social connectedness and health. *Encyclopaedia of Geropsychology*, 46-41. doi 10.1007/978-981-287-080-3_46-1

Herring, M. P., O'Connor, P. J., & Dishman, R. K. (2010). The effect of exercise training on anxiety symptoms among patients: a systematic review. *Archives of Internal Medicine*, 170(4), 321-331. doi: 10.1001/archinternmed.2009.530

Hill, E. L., Cumming, R. G., Lewis, R., Carrington, S., & Le Couteur, D. G. (2007). Sleep disturbances and falls in older adults. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, 62A(1), 62-66. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/62/1/62.full.pdf+html>

Holfeld, B., & Ruthig, J. C. (2014). A Longitudinal examination of sleep quality and physical activity in older adults. *Journal of Applied Gerontology*, 33(7), 791-807. doi:10.1177/0733464812455097

Hosmer, D. W. & Lemeshow, S. (2000). Applied logistic regression. In N. A. C. Cressie, N. I. Fisher, I. M. Johnstone, J. B. Kadane, D. W. Scott, Silverman B. W., A. F. M. Smith, & J. L. Teugels (Eds.), *Special topics* (pp. 260-351). New York: John Wiley & Son, INC.

Hosseini, H., Esfirizi, M. F., Marandi, S. M., & Rezaie, A. (2011). The effect of Tai Chi exercise on the sleep quality of the elderly residents in Isfahan, Sadeghieh elderly

home. *Iranian journal of nursing and midwifery research*, 16(1). Retrieved from <http://ijnmr.mui.ac.ir/index.php/ijnmr/article/viewFile/309/266>

Hui, E. K., & Rubenstein, L. Z. (2006). Promoting physical activity and exercise in older adults. *Journal of the American Medical Directors Association*, 7(5), 310-314 315p. doi: 10.1016/j.jamda.2006.03.006

Iftikhar, I. H., Donley, M. A., Mindel, J., Pleister, A., Soriano, S., & Magalang, U. J. (2015). Sleep duration and metabolic syndrome. An updated dose-risk metaanalysis. *Annals Of The American Thoracic Society*, 12(9), 1364-1372. doi:10.1513/AnnalsATS.201504-190OC

Im, E. O., Teng, H., Lee, Y., Kang, Y., Ham, O. K., Chee, E., & Chee, W. (2014). Physical activities and sleep-related symptoms in 4 major racial/ethnic groups of midlife women. *Family & community health*, 37(4), 307-316. doi:10.1097/FCH.0000000000000041

Inoue, S., Yorifuji, T., Sugiyama, M., Ohta, T., Ishikawa-Takata, K., & Doi, H. (2013). Does habitual physical activity prevent insomnia? A cross-sectional and longitudinal study of elderly Japanese. *Journal of Aging & Physical Activity*, 21(2), 119-139. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=S&aualast=Inoue&atitle=Does+habitual+physical+activity+prevent+insomnia%3F+A+cross-sectional+and+longitudinal+study+of+elderly+Japanese&title=Journal+of+aging+and+physical+activity&volume=21&issue=2&date=2013&sp>

Irwin, M. R., Olmstead, R., Carrillo, C., Sadeghi, N., Breen, E. C., Witarama, T., . . . Nicassio, P. (2014). Cognitive behavioral therapy vs. Tai Chi for late life

insomnia and inflammatory risk: A randomized controlled comparative efficacy trial. *Sleep*, 37(9), 1543-1552. Retrieved from <http://dx.doi.org/10.5665/sleep.4008>

Irwin, M. R., Olmstead, R., & Motivala, S. J. (2008). Improving sleep quality in older adults with moderate sleep complaints: A randomized controlled trial of Tai Chi Chih. *Sleep: Journal of Sleep and Sleep Disorders Research*, 31(7), 1001-1008. Retrieved from http://www.tcccommunity.net/uploads/Irwin_SLEEP_TCC_Sleep_Quality__2008.pdf

Izac, S. M. (2006). Basic anatomy and physiology of sleep. *American Journal of Electroneurodiagnostic Technology*, 46(1), 18-67 24p. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auunit=MSM&aulast=Izac&atitle=Basic+anatomy+and+physiology+of+sleep&id=doi:10.1080/1086508X.2006.11079555&title=American+journal+of+EEG+technology&volume=46&issue=1&date=2006&spage=18&issn=1086-508X>

Jackson, M. L., Sztendur, E. M., Diamond, N. T., Byles, J. E., & Bruck, D. (2014). Sleep difficulties and the development of depression and anxiety: A longitudinal study of young Australian women. *Archives of Women's Mental Health*, 17(3), 189-198. doi:10.1007/s00737-014-0417-8

Janyacharoen, T., Laophosri, M., Kanpittaya, J., Auvichayapat, P., & Sawanyawisuth, K. (2013). Physical performance in recently aged adults after 6 weeks traditional Thai dance: a randomized controlled trial. *Clinical interventions in aging*, 8, 855. Retrieved from <http://dx.doi.org/10.2147/CIA.S41076>

- Jarupunt, S., Paokanha, R., Subgranon, R., & Piputvawanicha, N. (2011). The effectiveness of an applied Boonmee long-stick danced exercise program with self-efficacy theory on depression and physical fitness for older adults in nursing home. *The Journal Of Faculty Of Nursing Burapha University*, 19(1), 42-56. Retrieved from http://file:///E:/Dissertation_Chontra/Lituration%20Review/Thai%20Journal_Elder%20Adults/Thai%20Exercise/Thai%20wand%20exercise.pdf
- Jirapramukpitak, T., Darawuttimaprakorn, N., Punpuing, S., & Abas, M. (2009). Validation and factor structure of the Thai version of the EURO-D scale for depression among older psychiatric patients. *Aging & Mental Health*, 13(6), 899-904. doi:10.1080/13607860903046479
- Jirapramukpitak, T., & Tanchaiswad, W. (1997). Sleep disturbances among nurses of Songklanagarind Hospital. *Journal of Psychiatric Association of Thailand*, 42(3), 123-132. Abstract retrieved from <http://www.dmh.go.th/abstract/details.asp?id=542>
- Jirong, Y., Changquan, H., Hongmei, W., & Bi-Rong, D. (2013). Association of sleep quality and dementia among long-lived Chinese older adults. *Age (Dordrecht, Netherlands)*, 35(4), 1423-1432. doi:10.1007/s11357-012-9432-8
- Jitapunkul, S., & Wivatvanit, S. (2009). National policies and programs for the aging population in Thailand. *Ageing International*, 33(1-4), 62-74. doi:10.1007/s12126-009-9027-6
- Kanhachon, W., Boonprakob, Y., Wanpen, S., & Boontha, K. (2014). Comparative effect of Paslop dancing and specific core stabilizing exercise on postural control and

core strength in sedentary subjects. *Bulletin of Chiang Mai Associated Medical Sciences*, 47(3), 143. Retrieved from file:///C:/Users/cp98f/Downloads/197-400-1-SM.pdf

Katewongsa, P., Sawangdee, Y., Yousomboon, C., & Choolert, P. (2014). Physical activity in Thailand: The general situation at national level. *Journal of Science & Medicine in Sport*, 18, e100-e101. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=P&aualast=Katewongsa&atitle=Physical+activity+in+Thailand:+the+general+situation+at+national+level&id=doi:10.1016/j.jsams.2014.11.374&title=Journal+of+science+and+medicine+in+sport&volume=18&date=2014&spage=e100&issn=1440-2440>

Kawamoto, R., & Doi, T. (2002). Sleep problems as a risk factor for fall in community-dwelling older adults. *Geriatrics & Gerontology International*, 2(1), 16-22. doi:10.1046/j.1444-1586.2002.00017.x

Keaw-Pang, P. (2004). การนอนหลับผิดปกติและปัจจัยที่เกี่ยวข้องของผู้ป่วยไตวายเรื้อรังระยะสุดท้ายที่ได้รับการฟอกเลือดด้วย. [Sleep disturbances and factors predicting sleep quality in patients with chronic kidney disease undergoing hemodialysis]. (Unpublished master thesis). Chulalongkorn University, Thailand.

Kennedy, A. B., & Resnick, P. B. (2015). Mindfulness and physical activity. *American Journal of Lifestyle Medicine*, 9(3), 221-223. doi: 10.1177/1559827614564546

Khamrani, A. A. A., Shams, A., Dehkordi, P. S., & Mohajeri, R. (2014). The effect of low and moderate intensity aerobic exercises on sleep quality in elderly adult males. *Pakistan Journal Of Medical Sciences*, 30(2), 417-421. doi:10.12669/pjms.302.4386

- Khullar, A. (2012). The role of melatonin in the circadian rhythm sleep-wake cycle: a review of endogenous and exogenous melatonin. *Psychiatric Times*, 29(7), 26-26. Abstract retrieved from <http://www.psychiatrictimes.com>
- King, A. C., Oman, R. F., Brassington, G. S., Bilwise, D. L., & Haskell, W. L. (1997). Moderate-intensity exercise and self-rated quality of sleep in older adults: a randomized controlled trial. *JAMA: Journal of the American Medical Association*, 277(1), 32-37. doi: 10.1001/jama.1997.03540250040029.
- King, A. C., Pruitt, L. A., Woo, S., Castro, C. M., Ahn, D. K., Vitiello, M. V., . . . Bliwise, D. L. (2008). Effects of moderate-intensity exercise on polysomnographic and subjective sleep quality in older adults with mild to moderate sleep complaints. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences*, 63A(9), 997-1004. Retrieved from <http://biomedgerontology.oxfordjournals.org/content/63/9/997.full.pdf+html>
- Kishimoto, Y., Okamoto, N., Saeki, K., Tomioka, K., Obayashi, K., Komatsu, M., & Kurumatani, N. (2016). Bodily pain, social support, depression symptoms and stroke history are independently associated with sleep disturbance among the elderly: a cross-sectional analysis of the Fujiwara-kyo study. *Environmental Health and Preventive Medicine*, 1-9. doi: 10.1007/s12199-016-0529-z
- Knodel, J., Prachuabmoh, V., & Chayavan, N. (2013). *The changing of well-being of Thai elderly: An update from the 2011 Survey of older adults in Thailand*. Institute for Social Research. University of Michigan. Retrived from <http://www.psc.isr.umich.edu/pubs/pdf/rr13-793.pdf>

- Kornbrot, D. (2014, April 22). Point biserial correlation. *Wiley StatsRef: Statistics Reference Online*. doi: 10.1002/9781118445112.stat06227
- Kraithaworn, P., Sirapo-ngam, Y., Piaseu, N., Nityasuddhi, D., & Gretebeck, K. A. (2011). Factors Predicting Physical Activity among Older Thais Living in Low Socioeconomic Urban Communities. *Pacific Rim International Journal of Nursing Research*, 15(1). Retrieved from file:///C:/Users/cp98f/Downloads/6539-12690-1-SM.pdf
- Krause, N., & Markides, K. (1990). Measuring social support among older adults. *The International Journal of Aging and Human Development*, 30(1), 37-53. Abstract retrieved from <http://ahd.sagepub.com/content/30/1/37.short>
- Kredlow, M., Capozzoli, M., Hearon, B., Calkins, A., & Otto, M. (2015). The effects of physical activity on sleep: a meta-analytic review. *Journal of Behavioral Medicine*, 38(3), 427-449. doi:10.1007/s10865-015-9617-6
- Krishnakumar, A., Narine, L., Soonthorndhada, A., & Thianlai, K. (2015). Family stressors, home demands and responsibilities, coping resources, social connectedness, and Thai older adult health problems: Examining gender variations. *Journal of Aging and Health*, 27(2), 257-283.
doi:10.1177/0898264314549658
- Krueger, P. M., & Friedman, E. M. (2009). Sleep duration in the United States: a cross-sectional population-based study. *American Journal of Epidemiology*, 169(9), 1052-1063. doi: 10.1093/aje/kwp023
- Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep Medicine*, 9(Suppl1), S10-S17. doi:10.1016/S1389-9457(08)70011-X

- KyuEun, L., NamSun, K., & SongHee, H. (2015). Gender difference in factors affecting quality of sleep among community dwelling elders. *International Journal of Bio-Science & Bio-Technology*, 7(1), 179-183. doi:10.14257/ijbsbt.2015.7.1.18
- Lambiase, M. J., Gabriel, K. P., Kuller, L. H., & Matthews, K. A. (2013). Temporal relationships between physical activity and sleep in older women. *Medicine & Science in Sports & Exercise*, 45(12), 2362-2368.
doi:10.1249/MSS.0b013e31829e4cea
- Lancee, B., & Radl, J. (2012). Social connectedness and the transition from work to retirement. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, doi:10.1093/geronb/gbs049
- Landry, G. J., Best, J. R., & Liu-Ambrose, T. (2015). Measuring sleep quality in older adults: a comparison using subjective and objective methods. *Frontiers in aging neuroscience*, 7. doi: 10.3389/fnagi.2015.00166
- Lee, Y.-T., Tsai, C.-F., Ouyang, W.-C., Yang, A. C., Yang, C.-H., & Hwang, J.-P. (2013). Daytime sleepiness: A risk factor for poor social engagement among the elderly. *Psychogeriatrics: The Official Journal Of The Japanese Psychogeriatric Society*, 13(4), 213-220. doi:10.1111/psyg.12020
- Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-based dentistry*, 7(1), 24-25. Retrived from <http://www.nature.com/ebd/journal/v7/n1/pdf/6400375a.pdf>
- Li, Fisher, K. J., Harmer, P., Irbe, D., Tearse, R. G., & Weimer, C. (2004). Tai chi and self-rated quality of sleep and daytime sleepiness in older adults: a randomized

- controlled trial. *Journal of the American Geriatrics Society*, 52(6), 892-900.
doi:10.1111/j.1532-5415.2004.52255.x
- Li, J., Yao, Y. S., Dong, Q., Dong, Y. H., Liu, J. J., Yang, L. S., & Huang, F. (2013). Characterization and factors associated with sleep quality among rural elderly in China. *Arch Gerontol Geriatr*, 56(1), 237-243. doi:10.1016/j.archger.2012.08.002
- Liu, X., & Liu, L. (2005). Sleep habits and insomnia in a sample of elderly persons in China. *Sleep-New York Then Westchester*, 28(12), 1579. Retrieved from <http://www.journalsleep.org/Articles/281215.pdf>
- Liu, X., Uchiyama, M., Kim, K., Okawa, M., Shibui, K., Kudo, Y., . . . Ogihara, R. (2000). Sleep loss and daytime sleepiness in the general adult population of Japan. *Psychiatry Research*, 93(1), 1-11. doi:10.1016/S0165-1781(99)00119-5
- Lo, C. M.-H., & Lee, P. H. (2014). Feasibility and effects of Tai Chi for the promotion of sleep quality and quality of life. *Journal of Gerontological Nursing*, 40(3), 46-52. doi:10.3928/00989134-20131028-08
- Lomex, R. G. & Hahs-Vaughn, D. L. (2015). Statistical concepts: A second course. In R. G. Lomex & D. L. Hahs-Vaughn (Eds.), *Logistic regression* (pp. 419-462). New York: Taylor & Francis Groups, LLC.
- Loprinzi, P. D., Hyo, L., & Cardinal, B. J. (2015). Evidence to support including lifestyle light-intensity recommendations in physical activity guidelines for older adults. *American Journal of Health Promotion*, 29(5), 277-284. doi: 10.1016/j.mhpa.2011.08.001
- Lubben, J., Blozik, E., Gillmann, G., Iliffe, S., von Renteln Kruse, W., Beck, J. C., & Stuck, A. E. (2006). Performance of an abbreviated version of the Lubben Social

- Network Scale among three European community-dwelling older adult populations. *Gerontologist*, 46(4), 503-513. doi 10.1093/geront/46.4.503
- Lunde, L.-H., Pallesen, S., Krangnes, L., & Nordhus, I. H. (2010). Characteristics of sleep in older adults with chronic pain: a study based on actigraphy and self-reporting. *The Clinical Journal Of Pain*, 26(2), 132-137.
doi:10.1097/AJP.0b013e3181b61923
- Mahidol. (2016, January). Population of Thailand. *Mahidol Population Gazette*, 25.
Retrieved from <http://fopdev.or.th/en/situation-of-the-thai-elderly-population-situations/>
- Manzar, M. D., Sethi, M., & Hussain, M. E. (2012). Humidity and sleep: A review on thermal aspect. *Biological Rhythm Research*, 43(4), 439-457.
doi:10.1080/09291016.2011.597621
- Mazzotti, D. R., Guindalini, C., Sosa, A. L., Ferri, C. P., & Tufik, S. (2012). Prevalence and correlates for sleep complaints in older adults in low and middle income countries: A 10/66 Dementia Research Group study. *Sleep Medicine*, 13(6), 697-702. doi:10.1016/j.sleep.2012.02.009
- McHugh, J. E., Casey, A. M., & Lawlor, B. A. (2011). Psychosocial correlates of aspects of sleep quality in community-dwelling Irish older adults. *Aging & Mental Health*, 15(6), 749-755. doi:10.1080/13607863.2011.562180
- McMillan, S. C., Tofthagen, C., & Morgan, M. A. (2008). Relationships among pain, sleep disturbances, and depressive symptoms in outpatients from a comprehensive cancer center. *Journal of Oncology Nursing Forum*, 35(4), 603 - 611.
doi:10.1188/08.ONF.603-611

- Mesas, A. E., López-García, E., & Rodríguez-Artalejo, F. (2011). Self-reported sleep duration and falls in older adults. *Journal Of Sleep Research, 20*(1 part I), 21-27. doi:10.1111/j.1365-2869.2010.00867.x
- Millman, R. P. (2012). Sleep and aging. *Medicine & Health Rhode Island, 95*(3), 89 - 90. Retrieved from <http://www.rimed.org/medhealthri/2012-03/2012-03-88.pdf>
- Miyata, S., Noda, A., Iwamoto, K., Kawano, N., Okuda, M., & Ozaki, N. (2013). Poor sleep quality impairs cognitive performance in older adults. *Journal Of Sleep Research, 22*(5), 535-541. doi:10.1111/jsr.12054
- Montgomery, P., & Dennis, J. A. (2002). Physical exercise for sleep problems in adults aged 60+. *The Cochrane Database Of Systematic Reviews*(4). doi: 10.1002/14651858.CD003404
- Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep: Journal of Sleep and Sleep Disorders Research, 34*(5), 601-608. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3079939/pdf/aasm.34.5.601.pdf>
- Münch, M., Knoblauch, V., Blatter, K., Schröder, C., Schnitzler, C., Kräuchi, K., . . . Cajochen, C. (2005). Age-related attenuation of the evening circadian arousal signal in humans. *Neurobiology of Aging, 26*(9), 1307-1319. doi: 10.1016/j.neurobiolaging.2005.03.004
- Nagel, C. L., Markie, M. B., Richards, K. C., & Taylor, J. L. (2003). Sleep promotion in hospitalized elders. *MEDSURG Nursing, 12*(5), 279-290. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=CL&aulast>

=Nagel&atitle=Sleep+promotion+in+hospitalized+elders&title=Medsurg+nursing
&volume=12&issue=5&date=2003&spage=279&issn=1092-0811

National Sleep Foundation. (2006). *Mechanisms controlling sleep and wakefulnessSleep-wake cycle: Its physiology and impact on health*. Washington, DC: National Sleep Foundation. Retrieved from www.sleepfoundation.org

Neikrug, A. B., & Ancoli-Israel, S. (2010). Sleep disorders in the older adult—A mini-review. *Gerontology, 56*(2), 181-189. doi: 10.1159/000236900

Nishiyama, T., Mizuno, T., Kojima, M., Suzuki, S., Kitajima, T., Ando, K. B., . . .

Nakayama, M. (2014). Criterion validity of the Pittsburgh Sleep Quality Index and Epworth Sleepiness Scale for the diagnosis of sleep disorders. *Sleep Medicine, 15*(4), 422-429. doi:10.1016/j.sleep.2013.12.015

Nyqvist, F., Forsman, A. K., Giuntoli, G., & Cattan, M. (2013). Social capital as a resource for mental well-being in older adults: A systematic review. *Aging & Mental Health, 17*(4), 394-410. doi:10.1080/13607863.2012.742490

Nyunt, M. S. Z., Fones, C., Niti, M., & Ng, T. (2009). Criterion-based validity and reliability of the Geriatric Depression Screening Scale (GDS-15) in a large validation sample of community-living Asian older adults. *Aging & Mental Health, 13*(3), 376-382 377p. doi:10.1080/13607860902861027

Ogunbode, A. M., Adebusoye, L. A., Olowookere, O. O., Owolabi, M., & Ogunniyi, A. (2014). Factors associated with insomnia among elderly patients attending a geriatric centre in Nigeria. *Current Gerontology & Geriatrics Research, 1-10*. doi:10.1155/2014/780535

- Ohayon, M. M. (2008). From wakefulness to excessive sleepiness: What we know and still need to know. *Sleep medicine reviews, 12*(2), 129-141. doi: 10.1016/j.smrv.2008.01.001
- Ohayon, M. M., Carskadon, M. A., Guilleminault, C., & Vitiello, M. V. (2004). Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: Developing normative sleep values across the human lifespan. *Sleep: Journal of Sleep and Sleep Disorders Research, 27*(7), 1255-1273. Retrieved from https://www.researchgate.net/profile/Michael_Vitiello/publication/8140802_Meta-analysis_of_quantitative_sleep_parameters_from_childhood_to_old_age_in_healthy_individuals_Developing_normative_sleep_values_across_the_human_lifespan_Sleep_27_1255-1274/links/02bfe51226d35f28b1000000.pdf
- Ohayon, M. M., & Partinen, M. (2002). Insomnia and global sleep dissatisfaction in Finland. *Journal Of Sleep Research, 11*(4), 339-346. doi: 10.1046/j.1365-2869.2002.00317.x
- Osborne, J. W. (2015). *Best practices in logistic regression*. University of Louisville. California: Thousand Oaks.
- Pa, J., Goodson, W., Bloch, A., King, A. C., Yaffe, K., & Barnes, D. E. (2014). Effect of exercise and cognitive activity on self-reported sleep quality in community-dwelling older adults with cognitive complaints: A randomized controlled trial. *Journal of the American Geriatrics Society, 62*(12), 2319-2326. doi: 10.1111/jgs.13158

- Park, J.-H., Yoo, M.-S., & Bae, S. H. (2013). Prevalence and predictors of poor sleep quality in Korean older adults. *International Journal of Nursing Practice, 19*(2), 116-123. doi:10.1111/ijn.12047
- Passos, G. S., Poyares, D. L. R., Santana, M. G., Tufik, S., & Mello, M. T. d. (2012). Is exercise an alternative treatment for chronic insomnia? *Clinics (São Paulo, Brazil), 67*(6), 653-660. doi: 10.6061/clinics/2012(06)17
- Patel, K. V., Guralnik, J. M., Dansie, E. J., & Turk, D. C. (2013). Prevalence and impact of pain among older adults in the United States: Findings from the 2011 National Health and Aging Trends Study. *PAIN®, 154*(12), 2649-2657. Retrieved from <http://dx.doi.org/10.1016/j.pain.2013.07.029>
- Paudel, M. L., Taylor, B. C., Diem, S. J., Stone, K. L., Ancoli-Israel, S., Redline, S., & Ensrud, K. E. (2008). Association between depressive symptoms and sleep disturbances in community-dwelling older men. *Journal of the American Geriatrics Society, 56*(7), 1228-1235. doi:10.1111/j.1532-5415.2008.01753.x
- Peltzer, K. (2012). Sociodemographic and health correlates of sleep problems and duration in older adults in South Africa. *South African Journal of Psychiatry, 18*(4), 150-156. doi:10.7196/SAJP.369
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current opinion in psychiatry, 18*(2), 189-193. Retrieved from <http://dx.doi.org/10.1097/00001504-200503000-00013>
- Peungsuwan, P., Sermcheep, P., Harnmontree, P., Eungpinichpong, W., Puntumetakul, R., Chatchawan, U., & Yamauchi, J. (2014). The effectiveness of Thai exercise

with traditional massage on the pain, walking ability and QOL of older adults with knee osteoarthritis: A randomized controlled trial in the community. *Journal of Physical Therapy Science*, 26(1), 139-144. doi:10.1589/jpts.26.139

Pilcher, J. J., Schoeling, S. E., & Prosansky, C. M. (2000). Self-report sleep habits as predictors of subjective sleepiness. *Behavioral Medicine (Washington, D.C.)*, 25(4), 161-168. Retrieved from <http://web.b.ebscohost.com/ehost/detail/detail?vid=11&sid=0de9c427-aed6-4da4-8f3e-c3d5e35de253%40sessionmgr1&bdata=JkF1dGhUeXBIPWlwLGNvb2tpZSx1cmwsdWlkJnNpdGU9ZWwhvc3QtbGl2ZSZZy29wZT1zaXRI#AN=2000-07652-003&db=psyh>

Polit, D. F. & Back, C. T. (2004). Nursing research: Principles and methods. In D. F. Polit & C. T., Back (Eds.), *Measurement and data collection* (pp. 317-337). Philadelphia: Lippincott Williams & Wilkins.

Poolsawat, W. (2007). *Physical activity of the older adults in Bangkok* (Doctoral dissertation, Mahidol University). Retrieved from https://www.researchgate.net/publication/238755622_

Prachuabmoh, V. (2014). Gender and ageing: Southeast Asian perspectives. In T. W. Devasahayam (Ed.), *Gender and ageing Southeast Asian perspectives* (pp. 99 - 121). Singapore: ISEAS publishing.

Putilov, A. A., Munch, M. Y., & Cajochen, C. (2013). Principal component structuring of the non-REM Sleep EEG spectrum in older adults yields age-related changes in the sleep and wake drives. *Curr Aging Sci*, 6(3), 280-293. Retrieved from <http://dx.doi.org/10.1016/j.physbeh.2014.05.027>

- Rashid, A., Ong, E. K., & Eleanor Shu Yi, W. (2012). Sleep quality among residents of an old folk's home in Malaysia. *Iranian Journal of Nursing & Midwifery Research*, 17(7), 512-519. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3730455/?report=printable>
- Reid, K. J., Baron, K. G., Lu, B., Naylor, E., Wolfe, L., & Zee, P. C. (2010). Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. *Sleep Medicine*, 11(9), 934-940. doi:10.1016/j.sleep.2010.04.014
- Richards, K. C., Lambert, C., Beck, C. K., Bliwise, D. L., Evans, W. J., Kalra, G. K., . . . Sullivan, D. H. (2011). Strength training, walking, and social activity improve sleep in nursing home and assisted living residents: A randomized controlled trial. *Journal of the American Geriatrics Society*, 59(2), 214-223. doi: 10.1111/j.1532-5415.2010.03246.x
- Rodriguez, J. C., Dzierzewski, J. M., & Alessi, C. A. (2015). Sleep problems in the elderly. *Medical Clinics of North America*, 99(2), 431-439. doi: 10.1016/j.mcna.2014.11.013
- Roveda, E., Sciolla, C., Montaruli, A., Calogiuri, G., Angeli, A., & Carandente, F. (2011). Effects of endurance and strength acute exercise on night sleep quality. *International SportMed Journal*, 12(3), 113-124. Retrieved from https://www.researchgate.net/profile/Giovanna_Calogiuri/publication/235428933_Effects_of_endurance_and_strength_acute_exercise_on_night_sleep_quality/links/5665ccb808ae15e74634bd92.pdf
- Saccomano, S. J. (2014). Sleep Disorders in Older Adults. *Journal of Gerontological Nursing*, 40(3), 38-45. doi:10.3928/00989134-20131029-06

- Sampaio, R. A. C., Sewo Sampaio, P. Y., Yamada, M., Tsuboyama, T., & Arai, H. (2014). Self-reported quality of sleep is associated with bodily pain, vitality and cognitive impairment in Japanese older adults. *Geriatrics & Gerontology International, 14*(3), 628-635. doi:10.1111/ggi.12149
- Sandberg, J. C., Suerken, C. K., Quandt, S. A., Altizer, K. P., Bell, R. A., Lang, W., . . . Arcury, T. A. (2014). Self-reported sleep difficulties and self-care strategies among rural older adults. *Journal Of Evidence-Based Complementary & Alternative Medicine, 19*(1), 36-42. doi:10.1177/2156587213510005
- Sateia, M. J. (2014). International classification of sleep disorders-third edition: highlights and modifications. *CHEST, 146*(5), 1387-1394. doi:10.1378/chest.14-0970
- Schutzer, K. A., & Graves, B. S. (2004). Barriers and motivations to exercise in older adults. *Preventive medicine, 39*(5), 1056-1061. doi:10.1016/j.ypmed.2004.04.003
- Scullin, C. (2015). Top tips for better sleep. *Occupational Health, 67*(7), 16-17. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=C&aualast=Scullin&atitle=Top+tips+for+better+sleep&title=Occupational+health&volume=67&issue=7&date=2015&spage=16&issn=0029-7917>
- Segal, D. L., Qualls, S. H., & Smyer, M. A. (2011). Aging and mental health, In D. L. Segal, S. H. Qualls, & M. A. Smyer (Eds.), *Depression* (136-157). Massachusetts: Blackwell Publisher.
- Sexton, C. E., Storsve, A. B., Walhovd, K. B., Johansen-Berg, H., & Fjell, A. M. (2014). Poor sleep quality is associated with increased cortical atrophy in community-

dwelling adults. *Neurology*, 83(11), 967-973. doi: 10.1212/WNL.0000000000000774

Shams, A., Kamrani, A. A. A., Dehkordi, P. S., & Mohajeri, R. (2013). Moderate-intensity aerobic exercise improves sleep quality in men older adults. *Medicinski Glasnik / Medical Gazette*, 18(50), 9-17. Retrieved from <http://scindeks-clanci.ceon.rs/data/pdf/1452-0923/2013/1452-09231350009S.pdf>

Sherrill, D. L., Kotchou, K., & Quan, S. F. (1998). Association of physical activity and human sleep disorders. *Archives of internal medicine*, 158(17), 1894-1898. doi:10.1001/archinte.158.17.1894

Shiovitz-Ezra, S., & Litwin, H. (2012). Social network type and health-related behaviors: evidence from an American national survey. *Social Science & Medicine*, 75(5), 901-904. doi: 10.1016/j.socscimed.2012.04.031

Shizheng, D., Jianshu, D., Heng, Z., Shengji, J., Guihua, X., Zengxia, L., . . . Zhiling, S. (2015). Tai chi exercise for self-rated sleep quality in older adults: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 52(1), 368-379. doi:10.1016/j.ijnurstu.2014.05.009

Singh, A., & Misra, N. (2009). Loneliness, depression and sociability in old age. *Industrial Psychiatry Journal*, 18(1), 51-55. doi:10.4103/0972-6748.57861

Sitasuwan, T., Bussaratid, S., Ruttanaumpawan, P., & Chotinaiwattarakul, W. (2014). Reliability and validity of the Thai version of the Pittsburgh Sleep Quality Index [Supplemental material]. *Journal of the Medical Association of Thailand*, 97(3), S57-S67. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/24772581>

- Skelly, A. H., Leeman, J., Carlson, J., Soward, A. C. M., & Burns, D. (2008). Conceptual model of symptom-focused diabetes care for African Americans. *Journal of Nursing Scholarship, 40*(3), 261-267 267p. doi:10.1111/j.1547-5069.2008.00236.x
- Sok, S. R. (2008). Sleep patterns and insomnia management in Korean-American older adult immigrants. *Journal of Clinical Nursing, 17*(1), 135-143. doi: 10.1111/j.1365-2702.2006.01869.x
- Sophonratanapokin, B., Chaiyawat, P., & Sawangdee, Y. (2012). Reasons of exercise and no-exercise in the young-old elderly in Tambon Salaya, Nakhon Pathom. *Thammasat Medical Journal-ธรรมศาสตร์ เวช สาร, 11*(2), 137-146. Retrieved from <http://thailand.digitaljournals.org/index.php/TMJ/article/viewFile/9513/9359>
- Sperandei, S. (2014). Understanding logistic regression analysis. *Biochemia medica, 24*(1), 12-18. <http://dx.doi.org/10.11613/BM.2014.003>
- Spira, A. P., Covinsky, K., Rebok, G. W., Punjabi, N. M., Stone, K. L., Hillier, T. A., . . . Yaffe, K. (2012). Poor sleep quality and functional decline in older women. *Journal of the American Geriatrics Society, 60*(6), 1092-1098. doi: 10.1111/j.1532-5415.2012.03968.x
- St George, R. J., Delbaere, K., Williams, P., & Lord, S. R. (2009). Sleep quality and falls in older adults living in self- and assisted-care villages. *Gerontology, 55*(2), 162-168. doi: 10.1159/000146786
- Stamatakis, E., Davis, M., Stathi, A., & Hamer, M. (2012). Associations between multiple indicators of objectively-measured and self-reported sedentary behaviour

and cardiometabolic risk in older adults. *Preventive Medicine*, 54(1), 82-87.

Retrieved from <http://dx.doi.org/10.1016/j.ypmed.2011.10.009>

Stewart, A. L., Mills, K. M., King, A. C., Haskell, W. L., Gillis, D., & Ritter, P. L. (2001). CHAMPS physical activity questionnaire for older adults: outcomes for interventions. *Medicine and science in sports and exercise*, 33(7), 1126-1141. doi: 10.1016/j.ypmed.2011.10.009

Stoltzfus, J. C. (2011). Logistic regression: a brief primer. *Academic Emergency Medicine*, 18(10), 1099-1104. doi: 10.1111/j.1553-2712.2011.01185.x

Strand, L. B., Carnethon, M., Biggs, M. L., Djoussé, L., Kaplan, R. C., Siscovick, D. S., ... & Mukamal, K. J. (2015). Sleep disturbances and glucose metabolism in older adults: the Cardiovascular Health Study. *Diabetes care*, 38(11), 2050-2058. doi: 10.2337/dc15-0137

Stranges, S., Tigbe, W., Gómez-Olivé, F. X., Thorogood, M., & Kandala, N.-B. (2012). Sleep problems: an emerging global epidemic? Findings from the INDEPTH WHO-SAGE study among more than 40,000 older adults from 8 countries across Africa and Asia. *Sleep*, 35(8), 1173-1181. <http://dx.doi.org/10.5665/sleep.2012>

Stubbs, B., Binnekade, T. T., Soundy, A., Schofield, P., Huijnen, I. P., & Eggermont, L. H. (2013). Are older adults with chronic musculoskeletal pain less active than older adults without pain? A systematic review and meta-analysis. *Pain Medicine*, 14(9), 1316-1331. doi: 10.1111/pme.12154

Su, T.-P., Huang, S.-R., & Chou, P. (2004). Prevalence and risk factors of insomnia in community-dwelling Chinese elderly: a Taiwanese urban area survey. *The*

Australian And New Zealand Journal Of Psychiatry, 38(9), 706-713. doi
10.1080/j.1440-1614.2004.01444.x

Sukying, C., Bhokakul, V., & Udomsubpayakul, U. (2003). An epidemiological study on insomnia in an elderly Thai population. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet*, 86(4), 316-324.

Suzuki, E., Yorifuji, T., Ueshima, K., Takao, S., Sugiyama, M., Ohta, T., . . . Doi, H. (2009). Sleep duration, sleep quality and cardiovascular disease mortality among the elderly: A population-based cohort study. *Preventive Medicine*, 49(2/3), 135-141. doi: 10.1016/j.ypped.2009.06.016

Taboonpong, S., Puthsri, N., Kong-In, W., & Saejew, A. (2008). The effects of Tai Chi on sleep quality, well-being and physical performances among older adults. *Thai Journal of Nursing Research*, 12(1), 1-13. Retrieved from <http://www.tci-thaijo.org/index.php/PRIJNR/article/view/5887/5092>

Tantiphongwiwat, W. & Kong-In, W. (2012). *Effect of norabic exercise on blood pressure and physical fitness among elders with hypertension* (Unpublished master's thesis). Prince of Songkla University, Thailand.

Taylor, D. (2014). Physical activity is medicine for older adults. *Postgraduate medical journal*, 90(1059), 26-32. doi: 10.1136/postgradmedj-2012-131366

Teychenne, M., Ball, K., & Salmon, J. (2010). Sedentary behavior and depression among adults: a review. *International journal of behavioral medicine*, 17(4), 246-254. doi: 10.1007/s12529-010-9075-z

Thanakwang, K. (2008). Social networks and social support influencing health-promoting behaviors among Thai community-dwelling elderly. *Thai Journal of Nursing*

- Research*, 12(4), 243-258. Retrieved from http://www.tnc.or.th/files/2011/05/tnc_journal631/thai_journal_of_nursing_research_vol_12_no_4_oct_33974.pdf.
- Thanakwang, K., Ingersoll-Dayton, B., & Soonthorndhada, K. (2012). The relationships among family, friends, and psychological well-being for Thai elderly. *Aging & Mental Health*, 16(8), 993-1003. doi:10.1080/13607863.2012.692762
- Thanakwang, K., & Soonthorndhada, K. (2011). Mechanisms by which social support networks influence healthy aging among Thai community-dwelling elderly. *Journal of Aging & Health*, 23(8), 1352-1378. doi:10.1177/0898264311418503
- The Department of Mental Health. (2011). *Geriatric depression depression scale*. Retrieved from <http://www.dmh.go.th/test/depress/asheet.asp?qid=1>
- The Nation Economic and the Social Development Board. (2015). *Aging population: A profile of Thailand*. Retrieved from https://www.m-society.go.th/article_attach/13225/17347.pdf
- Thomas, P. A. (2011). Gender, social engagement, and limitations in late life. *Social Science & Medicine*, 73(9), 1428-1435. doi:10.1016/j.socscimed.2011.07.035
- Toepoel, V. (2013). Ageing, leisure, and social connectedness: How could leisure help reduce isolation of older adults? *Social Indicators Research*, 113(1), 355-372. doi:10.1007/s11205-012-0097-6
- Troxel, W. M., Buysse, D. J., Monk, T. H., Begley, A., & Hall, M. (2010). Does social support differentially affect sleep in older adults with versus without insomnia? *Journal of Psychosomatic Research*, 69(5), 459-466. doi: 10.1016/j.jpsychores.2010.04.003

- Tsai, Y., Wong, T. K. S., & Ku, Y. (2008). Self-care management of sleep disturbances and risk factors for poor sleep among older residents of Taiwanese nursing homes. *Journal of Clinical Nursing, 17*(9), 1219-1226. doi:10.1111/j.1365-2702.2007.02020.x
- Uchida, S., Shioda, K., Morita, Y., Kubota, C., Ganeko, M., & Takeda, N. (2012). Exercise effects on sleep physiology. *Frontiers In Neurology, 3*, 48-48. doi:10.3389/fneur.2012.00048
- Van Bel, D. T., Smolders, K., IJsselsteijn, W. A., & de Kort, Y. (2009). Social connectedness: concept and measurement. *Intelligent Environments, 2*, 67-74.
- Van Cauter, E., Leproult, R., & Plat, L. (2000). Age-related changes in slow wave sleep and REM sleep and relationship with growth hormone and cortisol levels in healthy men. *JAMA: Journal of the American Medical Association, 284*(7), 861-868 868p. doi: 10.3233/978-1-60750-034-6-67
- Vaz Fragoso, C. A., & Gill, T. M. (2007). Sleep complaints in community-living older adults: a multifactorial geriatric syndrome. *Journal of the American Geriatrics Society, 55*(11), 1853-1866. doi:10.1111/j.1532-5415.2007.01399.x
- Visuthipanich, V., Sirapo-ngam, Y., Malathum, P., Kijboonchoo, K., Vorapongsathorn, T., & Winters-Stone, K. (2009). Physical activity questionnaire development and testing among elderly community-dwelling Thais. *Thai Journal of Nursing Research, 13*(4), 249-267. Retrieved from file:///C:/Users/cp98f/Downloads/6467-12537-1-SM.pdf
- Vitiello, M. V., Rybarczyk, B., Von Korff, M., & Stepanski, E. J. (2009). Cognitive behavioral therapy for insomnia improves sleep and decreases pain in older adults

- with co-morbid insomnia and osteoarthritis. *Journal of Clinical Sleep Medicine*, 5(4), 355-362. doi: 10.1111/jgs.12275
- Vittinghoff, E., & McCulloch, C. E. (2007). Relaxing the rule of ten events per variable in logistic and Cox regression. *American Journal of Epidemiology*, 165(6), 710-718. doi: 10.1093/aje/kwk052
- Viwatpanich, K. (2012). Situation and direction of research-thesis in elder club in Thailand. *Thammasat Medical Journal*, 12(2), 331-337. Retrieved from <http://www.tci-thaijo.org/index.php/tmj/article/view/14026/12759>
- Wang, X., & Youngstedt, S. D. (2014). Sleep quality improved following a single session of moderate-intensity aerobic exercise in older women: Results from a pilot study. *Journal of Sport and Health Science*, 3(4), 338-342. doi: 10.1016/j.jshs.2013.11.004
- Warner, L., Ziegelmann, J., Schüz, B., Wurm, S., & Schwarzer, R. (2011). Synergistic effect of social support and self-efficacy on physical exercise in older adults. *Journal of Aging & Physical Activity*, 19(3), 249-261. Retrieved from <http://ew3dm6nd8c.scholar.serialssolutions.com/?sid=google&auinit=LM&aualast=Warner&atitle=Synergistic+effect+of+social+support+and+self-efficacy+on+physical+exercise+in+older+adults&title=Journal+of+aging+and+physical+activity&volume=19&issue=3&date=2011&spage=249&issn=1063-8652>
- Wichitsranoi, J., Pilarit, J., Klomkamonl, W., Ploynamngern, N., & Wongsathikun, J. (2011). Effects of Thai wand exercise on lung capacity in sedentary young adults. *Journal of Pharmaceutical and BioSciences*, 24(1), 64-69. Retrieved from <https://www.researchgate.net/publication/281088439>

- Wirtz, P. H., von Känel, R., Mohiyeddini, C., Emini, L., Ruedisueli, K., Groessbauer, S., & Ehlert, U. (2006). Low social support and poor emotional regulation are associated with increased stress hormone reactivity to mental stress in systemic hypertension. *The Journal of Clinical Endocrinology & Metabolism*, *91*(10), 3857-3865. doi: 10.1210/jc.2005-2586
- Wolkove, Elkholy, Baltzan, & Palayew. (2007). Sleep and aging: 1. Sleep disorders commonly found in older adults. *CMAJ: Canadian Medical Association Journal Supplement*, *176*(9), 1299-1304. doi:10.1503/cmaj.060792
- Wongpakaran, N., Wongpakaran, T., & Van Reekum, R. (2013). The Use of GDS-15 in Detecting MDD: A comparison between residents in a Thai long-term care home and geriatric outpatients. *Journal Of Clinical Medicine Research*, *5*(2), 101-111. doi:10.4021/jocmr1239w
- World Health Organization (2015). *World report on ageing and health*. Retrieved from http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1
- Wu, C. Y., Su, T. P., Fang, C. L., & Yeh Chang, M. (2012). Sleep quality among community-dwelling elderly people and its demographic, mental, and physical correlates. *J Chin Med Assoc*, *75*(2), 75-80. doi:10.1016/j.jcma.2011.12.011
- Xiao, Q., Keadle, S. K., Hollenbeck, A. R., & Matthews, C. E. (2014). Sleep duration and total and cause-specific mortality in a large US cohort: Interrelationships With Physical Activity, Sedentary Behavior, and Body Mass Index. *American Journal of Epidemiology*, *180*(10), 997-1006. doi:10.1093/aje/kwu222

- Yang, C.-Y., & Chiou, A.-F. (2012). Predictors of sleep quality in community-dwelling older adults in Northern Taiwan. *The Journal Of Nursing Research: JNR*, 20(4), 249-260. doi:10.1097/jnr.0b013e3182736461
- Yang, P.-Y., Ho, K.-H., Chen, H.-C., & Chien, M.-Y. (2012). Exercise training improves sleep quality in middle-aged and older adults with sleep problems: a systematic review. *Journal of Physiotherapy (Elsevier)*, 58(3), 157-163. doi:10.1016/S1836-9553(12)70106-6
- Yao, K., Yu, S., Cheng, S., & Chen, I. (2008). Relationships between personal, depression and social network factors and sleep quality in community-dwelling older adults. *Journal of Nursing Research (Taiwan Nurses Association)*, 16(2), 131-138. doi: 10.1097/01.JNR.0000387298.37419.ff
- Yesavage, J. A., & Sheikh, J. I. (1986). Geriatric Depression Scale (GDS) recent evidence and development of a shorter violence. *Clinical Gerontologist*, 5(1-2), 165-173.
- Youngstedt, S. D. (2005). Effects of exercise on sleep. *Clinics in sports medicine*, 24(2), 355-365.
- Zisapel, N. (2001). Circadian rhythm sleep disorders: pathophysiology and potential approaches to management. *CNS Drugs*, 15(4), 311-328. Abstract retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/11463135>
- Zong-Yan, C., Wen-Chyuan Chen, K., & Huei-Jhen, W. (2014). Effects of a group-based step aerobics training on sleep quality and melatonin levels in sleep-impaired postmenopausal women. *Journal of Strength & Conditioning Research*

(Lippincott Williams & Wilkins), 28(9), 2597-2603. doi: 10.1519/JSC.000000

0000000428

Appendix A

Institutional Review Board (IRB)



Institutional Review Board
University of Missouri-Columbia

190 Galena Hall; Dc074.00
Columbia, MO 65212
573-882-3181
irb@missouri.edu

December 10, 2015

Principal Investigator: Chantra Promnoi
Department: University Stores

Your IRB Application to project entitled Exercise Participation and Sleep Quality in Thai Older Adults was reviewed and approved by the MU Institutional Review Board according to the terms and conditions described below:

| | |
|-----------------------------------|-----------------------------|
| IRB Project Number | 2004252 |
| IRB Review Number | 210431 |
| Initial Application Approval Date | December 10, 2015 |
| IRB Expiration Date | December 10, 2016 |
| Level of Review | Expedited |
| Project Status | Active - Open to Enrollment |
| Expedited Categories | 45 CFR 46.110.a(f)(7) |
| Risk Level | Minimal Risk |
| Type of Consent | Written Consent |
| Protocol Version/Date | V 1 - November 25, 2015 |

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
2. All unanticipated problems, adverse events, and deviations must be reported to the IRB within 5 days.
3. All changes must be IRB approved prior to implementation unless they are intended to reduce immediate risk.
4. All recruitment materials and methods must be approved by the IRB prior to being used.
5. The Continuing Review Report (CRR) must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date. If the study is complete, the Completion/Withdrawal Form may be submitted in lieu of the CRR.
6. Maintain all research records for a period of seven years from the project completion date.
7. Utilize the IRB stamped consent documents and other approved research documents located within the document storage section of eCompliance. These documents are highlighted green.

If you have any questions, please contact the IRB at 573-882-3181 or irb@missouri.edu.

Thank you,
MU Institutional Review Board

Appendix B

Introduction Letter



Office รหัส 0521.1.05/

Faculty of Nursing
Prince of Songkhla University

Kor Hong, Hat Yai. Songkhla, 90112

Date

Subject Introduction and Participant Recruitment

Dear Director's name

Attached documents

1. Research proposal
2. Research questionnaire

I am Chantra Promnoi, a faculty member at Faculty of Nursing, Prince of Songkla University and a doctoral student at the University of Missouri Sinclair School of Nursing. I will be conducting a research study to compare sleep quality of older adults who participated in exercise programs at elder clubs with sleep quality of older adults who perform an exercise program at home, and older adults who do not regularly exercise programs. I will be conducting this project from November 2015 to January 2016.

I aim to recruit 60 older adults per group (180 subjects in the total) with age 60 or older, participation in elder club-exercise programs at least twice a week over the past 3 months, home exercise, and no-regular exercise. Exclusion criteria are (1) primary sleep disorders (sleep apnea or abnormal legs movement), (2) an illness that limits activities of daily living or disturbs sleep, (3) history of cognitive or other neurological problems, (4) history of psychological disorders or alcohol/substance abuse, and (5) use of sleep/psychiatric medications or other medications affecting sleep more frequently than once a week.

All participants will be asked to answer questions on demographic characteristics, health conditions, pain level, depressive symptoms, social connectedness, sleep quality and problems, and physical activity. Each interview session will take about 45 minutes on average.

The participation in this study is voluntary. Participants will have the right to decide if they want to participate or not. They may withdraw from the study at any time without any penalty or loss of benefits. Demographic data will be labeled with a code number only, and all data collected will be kept strictly confidential.

I hope I will meet with you in the second week of November to discuss the project further. I will call you, and if you are willing, I will schedule an appointment for me to visit. Thank you in advance for considering this request.

Sincerely yours,

Chantra Promnoi

Chantra Promnoi, a PhD student



ที่ ศธ 0521.1.05/

คณะพยาบาล

ศาสตร์ มหาวิทยาลัยสงขลานครินทร์

ปทฝ.คอหงส์ อ.หาดใหญ่ จ.สงขลา 90112

วันที่

เรื่อง ขออนุญาตเก็บข้อมูลวิจัย

เรียน ผู้อำนวยการ โรงพยาบาลส่งเสริมสุขภาพตำบลประธานชมรมผู้สูงอายุ/

สิ่งที่แนบมา 1. โครงร่างวิจัย

2. แบบสอบถามสำหรับวิจัย

ดิฉันนางสาว จันทราพรหมน้อย อาจารย์ประจำคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ และ นักศึกษาปริญญาเอก คณะพยาบาลศาสตร์ มหาวิทยาลัยมิซซี่ ประเทศสหรัฐอเมริกา กำลังศึกษาวิจัยเพื่อเปรียบเทียบ คุณภาพการนอนหลับระหว่างกลุ่มผู้สูงอายุที่เข้าร่วมออกกำลังกาย ณ ชมรมผู้สูงอายุและกลุ่มผู้สูงอายุที่ไม่ได้เข้าร่วม ตั้งแต่เดือนพฤศจิกายน 2558 ถึงเดือนมกราคม 2559

ดิฉันวางแผนจะคัดเลือกสมาชิกผู้สูงอายุจำนวน 60 คนต่อกลุ่ม รวม180 คน ที่มีอายุ 60 ปีขึ้นไป ไม่มีปัญหา บกพร่องเรื่องความจำ และมาออกกำลังกายสม่ำเสมอที่ชมรมของท่าน หรือออกกำลังกายสม่ำเสมอที่บ้าน หรือ ไม่ออก กกำลังกาย ทั้งนี้ ผู้สูงอายุต้องไม่มีปัญหา ดังต่อไปนี้ (1) ไม่เคยได้รับการวินิจฉัย การหยุดหายใจขณะหลับ หรือการ เคลื่อนไหวของขาผิดปกติเวลากลางคืน (2) มีปัญหาสุขภาพที่กระทบการนอน หรือจำกัดการปฏิบัติกิจวัตรประจำวัน เช่น ปวดข้อหรือปวดหลังระดับรุนแรง หอบหืดระยะเฉียบพลัน หรือ ถุงลมโป่งพอง หัวใจวายหรือเจ็บหน้าอกที่อาการยังไม่คงที่ เบาหวานที่ระดับน้ำตาลไม่คงที่ (3) ประวัติมีปัญหาคความจำเสื่อม หรือความผิดปกติทางระบบประสาท เช่น อัลไซเมอร์ พาร์กินสัน หรืออัมพฤกษ์ (4) ความผิดปกติทางจิต หรือดื่มสุราหรือใช้สารเสพติด และ)5)ใช้ยานอนหลับหรือ (ยาอื่นที่มีผลต่อการนอนหลับ เกิน1 ครั้งต่อสัปดาห์

ผู้สูงอายุที่มีคุณสมบัติตามเกณฑ์และยินดีเข้าร่วมการวิจัย จะต้องแสดงการตอบรับเข้าร่วมวิจัยก่อน การเก็บ รวบรวมข้อมูล ผู้เข้าร่วมวิจัยจะต้องตอบคำถามเกี่ยวกับ ข้อมูลส่วนบุคคล ปัญหาสุขภาพ ความปวด ภาวะทางอารมณ์ การมีส่วนร่วมในกิจกรรมหรือความเชื่อมโยงทางสังคม การนอนหลับ และกิจกรรมทางกาย ทั้งนี้ ผู้วิจัยจะใช้เวลาใน การสัมภาษณ์ โดยประมาณ 45 นาที

การเข้าร่วมวิจัยครั้งนี้จะเป็นไปด้วยความสมัครใจ ผู้เข้าร่วมวิจัยมีสิทธิในการบอกเลิกได้ตลอดเวลา โดยไม่มี ผลกระทบต่อสิทธิประโยชน์ที่จะได้รับจากชมรมผู้สูงอายุหรืออื่นๆ ข้อมูลที่ได้จะถูกเก็บเป็นความลับ และนำเสนอใน ภาพรวมเท่านั้น

ดิฉันหวังเป็นอย่างยิ่งว่าจะได้รับการตอบรับเพื่อดำเนินการต่อไป จัก เป็นพระคุณยิ่ง

ขอแสดงความนับถือ

Chan Wamtoy

นางสาวจันทรา พรหมน้อย

นักศึกษาปริญญาเอก

Appendix C

Flyers and Advertisements

Flyers: Elder Club Members



Sinclair School of Nursing University of Missouri



Participants Needed for Research on Sleep Quality in Thai Elders

I am looking for people age 60 or older who live at home and attend elder club exercise programs twice a week.

I will ask you to answer questions about personal data, health, mood, social connection, sleep, and physical activity that will take you about 45 minutes.

Each interview session will be held at Health Promotion Hospitals where you receive healthcare services.

Your information will be useful to inform healthcare providers about the benefits of exercise participation to improve sleep quality.

To volunteer for this study, or learn more about it, please contact:

Name XXXXX, a director of XXXXX

Or

Chantra Promnoi, PhD student

University of Missouri Sinclair School of Nursing

Columbia, MO 65211

Mobile: 061-963-9242



คณะพยาบาลศาสตร์
มหาวิทยาลัยเชียงใหม่



ต้องการอาสาสมัครเข้าร่วมวิจัย เกี่ยวกับคุณภาพการนอนหลับในผู้สูงอายุไทย

ดิฉันกำลังรับสมัครผู้ที่มีอายุ 60 ปีขึ้นไป ที่อาศัยอยู่ที่บ้าน และเข้าร่วมกิจกรรมออกกำลังกาย ๓ ชมรมผู้สูงอายุ อย่างน้อย 2 ครั้งต่อสัปดาห์

หากท่านยินดีเข้าร่วมวิจัย ท่านจะขอให้ตอบคำถามเกี่ยวกับ ข้อมูลทั่วไป สุขภาพ ภาวะอารมณ์ การปฏิสัมพันธ์กับสังคม การนอนหลับ และกิจกรรมทางกาย ใช้เวลาประมาณ 45 นาที ณ โรงพยาบาลส่งเสริมสุขภาพที่ท่านไปใช้บริการ

ข้อมูลที่ได้รับจากท่านมีประโยชน์เจ้าหน้าที่ด้านสุขภาพ ที่จะได้รู้ถึงประโยชน์ของการออกกำลังกายต่อการส่งเสริมการนอนหลับในผู้สูงอายุ

หากท่านต้องการอาสาสมัครเข้าร่วมโครงการ หรือต้องการข้อมูลเพิ่มเติม โปรดติดต่อ

คุณ XXXXX ผู้อำนวยการ XXXXX

หรือ

จันทรา พรหมน้อย, ผู้ช่วยศาสตราจารย์ นักศึกษาปริญญาเอก

คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่ เมืองโคลัมเบีย รัฐมิชิแกน 65211

โทร 061-963-9242

Flyers: Health Promotion Hospital



Sinclair School of Nursing



University of Missouri

Participants Needed for Research on Sleep Quality in Thai Elders

I am looking for people age 60 or older who live at home and do not attend any elder club exercise programs.

I will ask you to answer questions about personal data, health, mood, social connection, sleep, and physical activity that will take you about 45 minutes.

Each interview session will be held at Health Promotion Hospitals where you receive healthcare services.

Your information will be useful to inform healthcare providers about the benefits of exercise participation to improve sleep quality.

To volunteer for this study, or learn more about it, please contact:

Name XXXXX, a director of XXXXX

Or

Chantra Promnoi, PhD student

University of Missouri Sinclair School of Nursing

Columbia, MO 65211

Mobile: 061-963-9242



คณะพยาบาลศาสตร์
มหาวิทยาลัยมิชซูรี



ต้องการอาสาสมัครเข้าร่วมวิจัย เกี่ยวกับคุณภาพการนอนหลับในผู้สูงอายุไทย

ดิฉันกำลังรับสมัครผู้ที่มีอายุ 60 ปีขึ้นไป ที่อาศัยอยู่ที่บ้าน และไม่ได้เข้าร่วมออก
กำลัง ณ ชมรมผู้สูงอายุ

หากท่านยินดีเข้าร่วมวิจัย ท่านจะขอให้ตอบคำถามเกี่ยวกับ ข้อมูลทั่วไป สุขภาพ
ภาวะอารมณ์ การปฏิสัมพันธ์กับสังคม การนอนหลับ และกิจกรรมทางกาย ใช้เวลาประมาณ
45 นาที ณ โรงพยาบาลส่งเสริมสุขภาพที่ท่านไปใช้บริการ

ข้อมูลที่ได้รับจากท่านมีประโยชน์ต่อเจ้าหน้าที่ด้านสุขภาพ ที่จะได้รู้ถึงประโยชน์
ของการออกกำลังกายต่อการส่งเสริมการนอนหลับในผู้สูงอายุ

หากท่านต้องการอาสาสมัครเข้าร่วมโครงการ หรือต้องการข้อมูลเพิ่มเติม โปรด
ติดต่อ

คุณ XXXXX ผู้อำนวยการ XXXXX

หรือ

จันทรา พรหมน้อย, ผู้ช่วยศาสตราจารย์ นักศึกษาปริญญาเอก

คณะพยาบาลศาสตร์ มหาวิทยาลัยมิชซูรี เมือง โคลัมเบีย รัฐมิชซูรี 65211

โทร 061-963-9242

Appendix D

Invitation and Consent Form

Project Title: Exercise Participation and Sleep Quality in Thai Older Adults

IRB Number 2004252

To Whom It May Concern:

Sleeping well is essential for physical health and emotional well-being. In older adults, a good night's sleep is important to improve concentration and memory function while poor sleep leads to an increased risk of illness and falls, mood changes, and memory decline. Regular exercise may help to improve sleep for older adults. Therefore, this research is being done to explore possible benefits of exercise program participation on sleep quality.

I, Chantra Promnoi, am interested in studying "Exercise Participation and Sleep Quality in Thai Older Adults", which is part of my PhD program in Nursing at Sinclair School of Nursing University of Missouri, Columbia, Missouri, U.S.A. My study is exploring differences in sleep quality among older adults who currently attend exercise classes at elder clubs, older adults who perform an exercise program at home, and those who do not regularly exercise. I hope that knowledge gained from this study will inform healthcare providers about benefits of exercise participation for sleep quality. Thus, I would like to invite you to take part into this study.

You are being asked to take part in this study because you are an older adult (age 60 or older) who either currently performs exercise at the elder clubs at least twice a week, over the past 3 months or perform an exercise program at home or do not regularly exercise. You need to (1) not take sleep/psychiatric medications or others that make you feel sleepy more than once a week, (2) not have problems with memory at the time you begin the study, (3) not have an illness that disturbs sleep or limits activities of daily living, and (4) history of psychological disorders or alcohol/substance abuse.

If you are interested in this study, you will be asked to answer questions related to your sleep issues, physical activities, health problems (e.g. chronic health conditions and pain), mood, and social connection. If the responses indicate you are depressed or may cause harm to yourself or others, the director of health promotion hospitals will be notified. It will take you about 45 minutes to answer all questions.

There are no foreseeable risks associated with participating in this study. Participating in this study is voluntary. You can change your mind and withdraw from this study at any time without penalty or loss of benefits.

If you decide to participate in the study, I will ask you to respond questions, and you will be free to provide real answers and refuse to respond questions that make you feel uncomfortable. Your answers will not be right or wrong, and they will be used for education solely. Your personal data will be kept confidential. Information produced by this study will be stored in the investigator's file and identified by a code number only. The code key connecting your name to specific information about you will be kept in a separate, secure location and will not be identified in any publications or reports. Information contained in your records may not be given to anyone unaffiliated with the study in a form that could identify you without your written consent, except as required by law.

If you have any questions regarding the participation in this research and/or any concerns about the study, you can contact me, Chantra Promnoi, any time at Surgical Nursing department, Faculty of Nursing, Prince of Songkla University, Tel. (061) 9639242 or E-mail address: cp98f@mail.missouri.edu or chantra.p@psu.ac.th.

Sincerely Thanks,
Chantra Promnoi, M.S.N. RN
Researcher/Doctoral Student

Signatures:

I, Mr./Ms./Miss(Full name).....(Family name), am willing to take part into the research study entitled “Exercise Participation and Sleep Quality in Thai Older Adults” by answering questionnaires. Miss Chantra Promnoi already informed me about a face-to-face-interview and self-completed questionnaire, and the advocacy for a person who participates in the study. I am voluntary to participate in this study. I can withdraw from this study at any time without any penalty or loss of benefits to which you are otherwise entitled, or effects on those who are confederates.

Signature

Subject.....
Researcher.....
Witness.....
Date.....

ใบเชิญชวนและยินยอมเข้าร่วมวิจัย

ชื่อโครงการ การมีส่วนร่วมในการออกกำลังกายและคุณภาพการนอนหลับในผู้สูงอายุไทย

เลขที่อนุญาตจริยธรรม 2004252

เรียนท่านผู้อ่านที่นับถือ

การนอนหลับมีความสำคัญต่อการรักษาความสมดุลของร่างกายและจิตใจ การนอนหลับที่ไม่เพียงพอจะส่งผลกระทบต่อร่างกายและจิตใจของผู้สูงอายุ เช่น เสี่ยงต่อภาวะหกล้ม อ่อนล้า ภาวะหลงลืมง่าย และอารมณ์เปลี่ยนแปลง ดังนั้นการส่งเสริมการนอนหลับที่มีคุณภาพ จึงมีความจำเป็น ทั้งนี้การออกกำลังกายเป็นประจำ อาจเป็น วิธีการช่วยส่งเสริม การนอนหลับที่ดี ในผู้สูงอายุ ดิฉันจึงมีความสนใจที่จะศึกษาประโยชน์ของการออกกำลังกายต่อคุณภาพการนอนหลับ

ดิฉัน นางสาวจันทรา พรหมน้อย มีความสนใจที่จะศึกษา “การมีส่วนร่วมในการออกกำลัง กาย และคุณภาพการนอนหลับในผู้สูงอายุไทย” เป็นส่วนหนึ่งของการศึกษาหลักสูตรปริญญาเอก สาขาการพยาบาลศาสตร์ คณะพยาบาลศาสตร์ มหาวิทยาลัยมิชซูรี เมืองโคลัมเบีย รัฐมิชซูรี ประเทศสหรัฐอเมริกา การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาความแตกต่างของคุณภาพการนอนหลับ ระหว่างผู้สูงอายุที่ออกกำลังกายเป็นประจำ ณ ชุมรมผู้สูงอายุ ผู้สูงอายุที่ออกกำลังกายเป็นประจำ ที่บ้าน และผู้สูงอายุที่ไม่ออกกำลังกาย ข้อมูลที่ได้จากการวิจัยครั้งนี้ จะช่วยให้เจ้าหน้าที่สุขภาพ ด้านผู้สูงอายุทราบถึงประโยชน์ของการออกกำลังกายต่อคุณภาพการนอนหลับ

ท่านถูกเชิญเข้าร่วมการวิจัยคุณภาพการนอนหลับครั้งนี้ เนื่องจากท่านมีอายุ 60 ปีขึ้นไป เข้าร่วมออกกำลังกายที่ชมรมผู้สูงอายุอย่างน้อย 2 ครั้งต่อสัปดาห์ ในช่วง 3 เดือนที่ผ่านมา หรือ ออกกำลังกายเองที่บ้าน หรือ ไม่ออกกำลังกาย หากท่านสนใจเข้าร่วมวิจัยครั้งนี้ ท่านต้องไม่ รับประทานยานอนหลับหรือยาอื่นๆ ที่มีผลกับการนอนหลับ เกิน 1 ครั้งต่อสัปดาห์ และไม่มีปัญหา ความจำ ท่านต้องไม่มีปัญหาสุขภาพที่กระทบการนอน หรือจำกัดการปฏิบัติกิจวัตรประจำวัน หรือ ประวัติเจ็บป่วยทางจิต หรือติดยาหรือสารเสพติดอื่นๆ

หากท่านสนใจเข้าร่วมวิจัยครั้งนี้ ดิฉันใคร่ขอความร่วมมือในการตอบแบบสัมภาษณ์เกี่ยวกับ การนอนหลับ กิจกรรมการออกกำลังกาย ปัญหาสุขภาพ เช่น โรคประจำตัว ความปวด และ ภาวะทางอารมณ์ หากคำตอบที่ได้ พบว่า ท่านมีภาวะซึมเศร้า หรือมีการกระทำที่เป็นอันตรายต่อ ตัวท่านเองหรือบุคคลอื่นๆ ข้อมูลเหล่านี้จะถูกรายงานไปยัง ผู้อำนวยการ โรงพยาบาลส่งเสริมสุขภาพ เพื่อประเมินปัญหาต่อไป การสัมภาษณ์และตอบแบบสอบถาม ใช้เวลาประมาณ 45 นาที

การวิจัยครั้งนี้ไม่มีความเสี่ยงใดๆ ต่อท่าน เพื่อเป็นประโยชน์ต่อการวิจัย ท่านสามารถตอบคำถามตามความรู้สึกที่แท้จริง และท่านสามารถปฏิเสธการตอบคำถามที่ทำให้ท่านรู้สึกไม่สบายใจแบบสอบถามนี้จะไม่ถูกคิด ข้อมูลที่รวบรวมได้จะนำไปใช้ในการศึกษาเท่านั้น และนำเสนอในภาพรวม ข้อมูลของท่านจะถูกเก็บไว้ในที่ที่ปลอดภัย ข้อมูลที่จะสามารถเชื่อมโยงถึงข้อมูลส่วนตัวของท่าน จะถูกเก็บเป็นความลับและไม่ถูกเผยแพร่ไปยังบุคคลอื่น โดยไม่ได้รับความยินยอมจากท่าน ยกเว้นเป็นการร้องขอตามกฎหมาย ข้อมูลที่ได้จะไม่มีผลกระทบใดๆ ต่อผู้เข้าร่วมวิจัยและบุคคลที่เกี่ยวข้อง ในการเข้าร่วมวิจัยครั้งนี้ ผู้เข้าร่วมวิจัยต้องเต็มใจ ยินยอมในการเข้าร่วมวิจัย และบอกเลิกการเข้าร่วมวิจัยได้ตลอดเวลา โดยไม่มีผลกระทบใดๆ

หากมีคำถามหรือข้อสงสัย ท่านสามารถสอบถามผู้วิจัยได้ตลอดเวลา ณ ภาควิชาการพยาบาล ศัลยศาสตร์ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ เบอร์โทร (061) 9639242 หรือ อีเมล cp98f@mail.missouri.edu หรือ chantra.p@psu.ac.th

ขอขอบคุณอย่างสูง

จันทรา พรหมน้อย

ผู้วิจัย/นักศึกษาปริญญาเอก

ลงนามการยินยอมเข้าร่วมวิจัย

ข้าพเจ้า นาย/นาง/นางสาว/ นามสกุล..... ยินยอมการเข้าร่วมโครงการวิจัยเรื่อง การมีส่วนร่วมในการออกกำลังกายและคุณภาพการนอนหลับในผู้สูงอายุไทย โดยการตอบ แบบสัมภาษณ์ โดยนางสาวจันทรา พรหมน้อย ได้ชี้แจงเกี่ยวกับการตอบแบบสัมภาษณ์ และแบบสอบถาม ตลอดจนการพิทักษ์สิทธิ์ผู้เข้าร่วมวิจัยตามเอกสารที่แนบมาแก่ข้าพเจ้าแล้ว ข้าพเจ้า ยินยอมเข้าร่วมการวิจัยครั้งนี้ด้วยความสมัครใจ และฉันสามารถถอนตัว จากการวิจัยครั้งนี้เมื่อใดก็ได้ ทั้งนี้จะไม่มีความเสี่ยงใดๆ ต่อตัวข้าพเจ้าเองและผู้เกี่ยวข้อง

ลงนามผู้เข้าร่วมวิจัย

ลงนามผู้วิจัย

ลงนามพยาน

วันที่.....

Appendix E

Research Questionnaires

Demographic Characteristics

1. Age _____ years
2. Gender (0) Male (1) Female
3. Educational level _____ years in school
4. Marital status (1) Single (2) Married (3) Divorced (4) Widowed
5. Living situations (1) Living alone (2) Living with children
 (3) Living with spouse/partner (4) Living with spouse and children
6. Exercise in the past month
 - 6.1 Attend exercise **AT ELDER CLUBS**
 (0) NO (Skip QUESTION 6.2 and move to complete QUESTION 6.3)
 (1) YES (Complete both QUESTION 6.2 and QUESTION 6.3)
 - 6.2 **ELDER CLUB** exercise participation
 - 6.2.1 **TYPES OF EXERCISES** you attend at elder clubs
 (1) Tai Chi (2) Dancing (3) Others
 - 6.2.2 On average, **HOW OFTEN** do you participate exercise programs per week?
 (1) 2 - 3 days (2) 4 – 5 days (3) > 5 days
- 6.3 Exercise at home or other places **NOT AT ELDER CLUB**
 (0) NO (1) YES

Health Conditions

Instructions: Have you ever been told by the doctor you have any health conditions?
Please place an “X” mark in the box of the answers.

| Items | No (0) | Yes (1) |
|--|--------|------------|
| 1. Heart disease | | |
| 2. Hypertension/high blood pressure | | |
| 3. Diabetes mellitus | | |
| 4. Lung diseases (asthma, emphysema, chronic bronchitis) | | |
| 5. Cancer | | |
| 6. Stroke | | |
| 7. Arthritis | | |
| 8. Osteoporosis | | |
| 9. Others Please note | | |

Depression (Thai Geriatric Depression Scale)

Instruction: Choose **THE BEST ANSWER** for how you have felt over the past week.

| Items | NO (0) | YES (1) |
|---|--------|---------|
| 1. Are you basically UNSATISFIED with your life? | | |
| 2. Have you dropped many of your activities and interests? | | |
| 3. Do you feel that your life is empty? | | |
| 4. Do you often get bored? | | |
| 5. Are you NOT in good spirits most of the time? | | |
| 6. Are you afraid that something bad is going to happen to you? | | |
| 7. Do you feel UNHAPPY most of the time? | | |
| 8. Do you often feel helpless? | | |
| 9. Do you prefer to stay at home, rather than going out and doing new things? | | |
| 10. Do you feel you have more problems with memory than most? | | |
| 11. Do you think it is NOT wonderful to be alive now? | | |
| 12. Do you feel worthless the way you are now? | | |
| 13. Do you feel NOT full of energy? | | |
| 14. Do you feel that your situation is hopeless? | | |
| 15. Do you think that most people are better off than you are? | | |

Social Connectedness:

Instruction: Please indicate the most accurate reply for your social networks and social support

Social Network Scale (family and friendships)

1. How many relatives do you see or hear from at least once a month?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9
2. How many relatives do you feel at ease with that you can talk about private matters?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9
3. How many relatives do you feel close to such that you could call on them for help?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9
4. How many of your friends do you see or hear from at least once a month?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9
5. How many friends do you feel at ease with that you can talk about private matters?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9
6. How many friends do you feel close to such that you could call on them for help?
 (0) none (1) one (2) two (3) 3 – 4 (4) 5 – 8 (5) ≥ 9

Social Support Scale

1. How often has family or friends suggested some action you should take in order to deal with problems you were having?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

2. How often has family or friends given you information that made a difficult situation easier to understand?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

3. How often has family or friends taken care and been right there with you in a stressful situation or when you got sick?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

4. How often has family or friends comforted you by showing you physical affection (e.g. speech, touch, hug, or kiss)?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

5. How often has family or friends listened to you talk about your private feelings?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

6. How often has family or friends expressed interest and concern in your well-being?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

7. How often has family or friends provided you food, clothes or groceries?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

8. How often has family or friends helped you do something that needed to get done inside the house like household chores?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

9. How often has family or friends taken you to the health service, provided emergency transportation to get to the doctor, or taken you on a trip someplace?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

10. How often has family or friends helped you do something outside the house (e.g. yard work, harvesting, or any income generating activity)?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

11. How often has family or friends lent or given you money?

(0) Never (1) Rarely (2) Sometimes (3) Often (4) Very often

Sleep Measure: The Thai Pittsburg Sleep Quality Index

Instructions: The following questions relate to your usual sleep habits during the past month. Please indicate the most accurate reply for the majority of days and nights in the past month.

1. When have you usually gone to bed? _____
2. How long (in minutes) has it taken you to fall asleep each night? _____
3. When have you usually gotten up in the morning? _____
4. A. How many hours of actual sleep do you get at night? _____
 B. How many hours were you in bed? _____

| 5. During the past month, how often have you had trouble sleeping because you..... | Not during the past month (0) | Less than Once a week (1) | Once or twice a week (2) | Three or more times a week (3) |
|---|-------------------------------|---------------------------|--------------------------|--------------------------------|
| 5.1 Cannot get to sleep within 30 minutes | | | | |
| 5.2 Wake up in the middle of the night or early morning | | | | |
| 5.3 Have to get up to use the bathroom | | | | |
| 5.4 Cannot breathe comfortably | | | | |
| 5.5 Cough or snore loudly | | | | |
| 5.6 Feel too cold | | | | |
| 5.7 Feel too hot | | | | |
| 5.8 Have bad dreams | | | | |
| 5.9 Have pain | | | | |
| 5.10 Other reasons..... | | | | |
| 6. During the past month, how often have you taken medicine (Prescribed or “over the counter”) to help you sleep? | | | | |
| 7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity? | | | | |
| 8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done? | | | | |
| 9. During the past month, how would you rate your sleep quality overall? | Very good (0) | Fairly good (1) | Fairly bad (2) | Very bad (3) |

Insomnia Severity Index (ISI)

Please rate the **CURRENT SEVERITY** of your insomnia problem(s) over the past month.

Note. Please **CIRCLE** the number that best describes your answer.

1. Difficulty falling asleep

(0) None (1) Mild (2) Moderate (3) Severe (4) very sever

2. Difficulty staying asleep

(0) None (1) Mild (2) Moderate (3) Severe (4) very sever

3. Problems waking up too early

(0) None (1) Mild (2) Moderate (3) Severe (4) very sever

4. How **SATISFIED/DISSATISFIED** are you with your **CURRENT** sleep pattern?

(0) Very satisfied (1) Satisfied (2) Moderately Satisfied

(3) Dissatisfied (4) Very dissatisfied

5. How **NOTICEABLE** to others do you think your sleep problem is in terms of impairing the quality of your life?

(0) Not at all noticeable (1) A Little (2) Somewhat (3) Much

(4) Very Much Noticeable

6. How **WORRIED/DISTRESSED** are you about your current sleep problem?

(0) Not at all worried (1) A Little (2) Somewhat (3) Much

(4) Very Much Worried

7. To what extent do you consider your sleep problem to **INTERFERE** with your daily functioning (e.g. daytime, fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) **CURRENTLY**?

(0) Not at all interfering (1) A Little (2) Somewhat (3) Much

(4) Very Much Interfering

Physical Activity

Instructions: Please indicate if you had engaged in each of the activities listed below over the past seven days. Place an “X” mark in the box related to the answer.

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| Household Physical Activity 1. Take care other people (children, elderly, patients, disable people) For example, <ul style="list-style-type: none"> • Cleaning, feeding, and serving food and milk • Taking others to walk for pleasure or exercise/ to see the doctor? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 2. Preparing and cooking food? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 3. Cleaning dishes or other equipment? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 4. Sweeping, vacuuming, mopping or cleaning the bathroom? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 5. Washing clothes (by machine)? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 6. Washing clothes (manually)? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 7. Iron? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 8. Cleaning windows, gutters, a refrigerator, a bicycle or a car? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 9. Cleaning a pet or pet’s cage? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| 10. Feeding a pet? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 11. Repairing electrical or other equipment or machines; or, repairing part of the house? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 12. Do light gardening, such as <ul style="list-style-type: none"> • Watering plants using a hose, dipper or bucket • Trimming small tree/bush branches • Pulling weeds/grass by hand • Raking or sacking leaves? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 13. Doing moderate to heavy gardening, such as <ul style="list-style-type: none"> • Cutting the grass with scissors or an electric mower • Planting a tree <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| Occupational Physical Activity | | | | | | |
| 14. Engaging in a light occupation, such as an administrator or counselor? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 15. Engaging in a moderate occupation, such as a teacher, merchant, hair-dresser, fortune-teller, traditional masseur or masseuse, taxi driver or photographer? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 16. Engaging in a heavy occupation, such as doing strenuous physical labor (lifting/carrying heavy materials)? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| Leisure Time---Recreation 17. Doing volunteer work, such as <ul style="list-style-type: none"> • Serving as a leader of the community elder club or religious activities • Being a health care or general volunteer? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 18. Doing religious activities, such as attending temple/church/mosque, praying, meditating or reading a religious text? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 19. Practicing religious activities, such as walking up and down or carrying out Islamic activities (Standing up and sitting down many times) to pay respect to Allah/God? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 20. Doing wood working, needlework, drawing, knitting, or other arts or crafts? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 21. Using a computer? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 22. Watching television? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 23. Playing light activity games, with other people, such as cards, bingo or board games? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 24. Playing moderate activity games, such as billiards? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 25. Attending a concert, movie, lecture or sports event? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| 26. Playing a musical instrument? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 27. Dancing (traditional or international)? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| Leisure Time---- Exercise | | | | | | |
| 28. Walking leisurely for exercise or pleasure; or, walking a dog? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 29. Walking fast or briskly for exercise? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 30. Jogging or running? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 31. Riding a bicycle or stationary cycle? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 32. Doing exercise with a treadmill? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 33. Using aerobic machines, other than a treadmill, such as a rowing machine or step-machine? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 34. Doing general conditioning exercise, such as light calisthenics using a bamboo stick; or, doing a sword dance? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 35. Carrying out stretching or flexing exercises? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 36. Engaging in Yoga or Tai-chi? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 37. Doing aerobics or anaerobic dancing? <input type="checkbox"/> Yes, How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| 38. Doing light strength training, such as using elastic bands or hand-held weights of 5 lbs. or less? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 39. Doing moderate to heavy strength training, such as • Using hand-held weights of more than 5 lbs. • Doing push-ups? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 40. Playing Pa-tong or bowling? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 41. Playing table tennis? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 42. Engaging in golf or miniature golf; or, using a golf driving range? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 43. Carrying or pulling golf equipment, when playing golf? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 44. Riding a cart, when playing golf? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 45. Playing double tennis? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 46. Playing single tennis? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 47. Playing badminton (pleasure or exercise)? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 48. Playing badminton (competition)? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |
| 49. Playing basketball or football? <input type="checkbox"/> Yes , How many TIMES a week? _____times <input type="checkbox"/> No | | | | | | |

| In the past 7 days, did you..... | How many TOTAL hours a week did you usually do it? | | | | | |
|--|--|-----------|----------|----------|----------|--------|
| | 0-1 hr | ≥ 1-3 hrs | ≥3-5 hrs | ≥5-7 hrs | ≥7-9 hrs | ≥9 hrs |
| 50. Swimming or doing water exercise? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| Transportation | | | | | | |
| 51. Walking to the bus, sky train or taxi; walking to do errands, such as to/from a store/bank; or, walking children to school? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 52. Walking to do errands, while carrying heavy items? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 53. Riding a motorcycle. <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| 54. Riding in a car? <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |
| General Question Addressing Any of the Four Domains | | | | | | |
| 55. Doing other types of physical activity, not previously mentioned. If so, specify the activity?..... <input type="checkbox"/> Yes , How many TIMES a week? _____ times <input type="checkbox"/> No | | | | | | |

Research Questionnaires (Thai Version)

แบบสัมภาษณ์ข้อมูลส่วนบุคคล

คำชี้แจง โปรดตอบคำถามที่ตรงกับความเป็นจริงมากที่สุด

1. อายุปี
2. เพศ (1) ชาย (2) หญิง
3. ระดับการศึกษา.....ปี (จำนวนปีในการศึกษา)
4. สถานภาพการสมรส (1) โสด (2) สมรส (3) หย่าร้าง (4) หม้าย
5. สถานภาพการอยู่อาศัย (1) อาศัยอยู่คนเดียว (2) อาศัยอยู่กับลูกหลาน
 (3)อาศัยอยู่กับคู่สมรส (4) อาศัยอยู่กับคู่สมรสและลูกหลาน
6. ประวัติการออกกำลังกายในช่วง 1 เดือนที่ผ่านมา
 - 6.1 ร่วมกิจกรรมออกกำลังกาย ณ ชมรมผู้สูงอายุ
 (0) ไม่ใช่ (ข้ามข้อ 6.2 ไปตอบข้อ 6.3) (1) ใช่ (ตอบคำถามทั้งข้อ 6.2 และ ข้อ 6.3)
 - 6.2 กิจกรรมออกกำลังกาย ณ ชมรม/กลุ่มผู้สูงอายุ
 - 6.2.1 ชนิดของการออกกำลังกาย ที่ท่านเข้าร่วมกับชมรมผู้สูงอายุ
 (1) ไทเก๊ก (2) กระบอง (3) เต็นรำ (4) อื่นๆ ระบุ.....
 - 6.2.2 จำนวนครั้งโดยเฉลี่ยต่อสัปดาห์ ที่ท่านออกกำลังกายกับชมรม/ กลุ่มผู้สูงอายุ
 (1) 2 -3 วัน (2) 4 - 5 วัน (3) > 5 วัน
 - 6.3 ออกกำลังกายที่บ้าน ที่ไม่ใช่กับชมรมผู้สูงอายุ (0) ไม่ใช่ (1) ใช่

แบบสัมภาษณ์ปัญหาสุขภาพ

คำชี้แจง ปัญหาสุขภาพที่ท่านเคยได้รับการวินิจฉัยจากแพทย์

| ปัญหา | ไม่มี (0) | มี (1) |
|---|-----------|--------|
| 1. โรคหัวใจ | | |
| 2. ความดันโลหิตสูง | | |
| 3. เบาหวาน | | |
| 4. โรคปอด (หอบหืด หลอดลมอักเสบเรื้อรัง หรือ ถุงลมโป่งพอง) | | |
| 5. มะเร็ง | | |
| 6. โรคหลอดเลือดสมอง | | |
| 7. ข้อเสื่อม | | |
| 8. กระดูกพรุน | | |
| 9. อื่นๆ โปรดระบุ | | |

แบบสัมภาษณ์ ประเมินระดับอาการซึมเศร้า

คำชี้แจง โปรดเลือกคำตอบที่ตรงกับความรู้สึกของท่านมากที่สุดในช่วงสัปดาห์ที่ผ่านมา

| ความรู้สึก | เคย (1) | ไม่เคย(0) |
|---|---------|-----------|
| 1. คุณไม่พึงพอใจกับความเป็นอยู่ตอนนี้ | | |
| 2. คุณไม่อยากทำในสิ่งที่เคยสนใจหรือเคยทำเป็นประจำ | | |
| 3. คุณรู้สึกว่าช่วงนี้ชีวิตว่างเปล่า ไม่รู้จะทำอะไร | | |
| 4. คุณรู้สึกเบื่อหน่ายบ่อยๆ | | |
| 5. ส่วนใหญ่คุณรู้สึกอารมณ์ไม่ดี | | |
| 6. คุณรู้สึกกลัวว่าจะมีเรื่องไม่ดีเกิดขึ้นกับคุณ | | |
| 7. บ่อยครั้งที่คุณรู้สึกไม่มีความสุข | | |
| 8. บ่อยครั้งที่คุณรู้สึกไม่มีที่พึ่ง | | |
| 9. คุณชอบอยู่กับบ้านมากกว่าที่จะออกนอกบ้านหรือสูงลิงกับคนอื่น | | |
| 10. คุณคิดว่าความจำของคุณไม่ดีเท่าคนอื่น | | |
| 11. คุณคิดว่า การมีชีวิตอยู่ ณ ขณะนี้เป็นเรื่องที่ไม่น่ายินดี | | |
| 12. คุณรู้สึกว่าชีวิตคุณไม่มีคุณค่า | | |
| 13. คุณรู้สึกเพลียง่าย ไม่ค่อยมีแรง | | |
| 14. คุณรู้สึกสิ้นหวัง | | |
| 15. คุณคิดว่าคนอื่นดีกว่าคุณ | | |

แบบสัมภาษณ์ความเชื่อมโยงทางสังคม

คำชี้แจง โปรดตอบคำถามที่ตรงกับความเป็นจริงมากที่สุดเกี่ยวกับปฏิสัมพันธ์กับบุคคลในครอบครัว/ญาติ/เพื่อน

เครือข่ายทางสังคม (ครอบครัวและเพื่อน)

1. จำนวนญาติที่ท่านพบปะ พูดคุย หรือติดต่ออย่างน้อยเดือนละครั้ง

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

2. จำนวนญาติที่ท่านสามารถพูดคุยเรื่องส่วนตัวหรือเรื่องอื่นๆที่สำคัญได้

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

3. จำนวนญาติที่ท่านรู้สึกใกล้ชิดและสามารถขอความช่วยเหลือได้

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

4. จำนวนเพื่อนที่ท่านพบปะ พูดคุยหรือติดต่ออย่างน้อยเดือนละครั้ง

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

5. จำนวนเพื่อนที่ท่านสามารถพูดคุยเรื่องส่วนตัวหรือเรื่องอื่นๆที่สำคัญได้

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

6. จำนวนเพื่อนที่ท่านรู้สึกใกล้ชิดและสามารถขอความช่วยเหลือได้

(0) ไม่มี (1) 1 คน (2) 2 คน (3) 3-4 คน (4) 5-8 คน (5) มากกว่า 9 คน

แหล่งสนับสนุนทางสังคม

1. คนในครอบครัว ญาติ หรือเพื่อนเสนอแนะวิธีแก้ปัญหาที่ท่านกำลังเผชิญอยู่ บ่อยอย่างไร

(0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

2. คนในครอบครัว ญาติหรือเพื่อน ให้ข้อมูลที่เพื่อคลี่คลายปัญหาหรือสถานการณ์ที่ยุ่งยากให้ง่ายขึ้น บ่อยอย่างไร

(0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

3. คนในครอบครัว ญาติ หรือเพื่อน ดูแลและอยู่เป็นเพื่อนในยามที่ท่านอยู่ในสถานการณ์ที่ตึงเครียดหรือเวลาไม่สบาย

(0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

4. คนในครอบครัว ญาติ หรือเพื่อนแสดงออกที่ทำให้ท่านอบอุ่นใจ เช่น พุด สัมผัส กอด หรือหอมแก้ม บ่อยอย่างไร

(0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

5. คนในครอบครัว ญาติ หรือเพื่อนรับฟังเวลาท่านระบายความรู้สึก บ่อยอย่างไร

- (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก
6. คนในครอบครัว ญาติ หรือเพื่อน ให้ความสนใจความเป็นอยู่ หรือ ความผาสุกของท่าน บ่อยอย่างไร
 (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก
7. คนในครอบครัว ญาติ หรือเพื่อน นำอาหาร เสื้อผ้า หรือของใช้อื่นๆ มาให้ท่าน บ่อยอย่างไร
 (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก
8. คนในครอบครัว ญาติ หรือเพื่อน ช่วยเหลือท่านในการทำงานภายในบ้าน บ่อยอย่างไร
 (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก
9. คนในครอบครัว ญาติ หรือเพื่อน ช่วยพาท่านไปโรงพยาบาล หรือไปสถานที่ต่างๆ บ่อยอย่างไร
 (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

10. คนในครอบครัว ญาติ หรือเพื่อน ช่วยงาน เช่น ทำสวน เพราะปลูก หรืองานเพื่อเสริมรายได้อื่นๆ บ่อยอย่างไร

- (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

11. คนในครอบครัว ญาติ หรือเพื่อน ช่วยเหลือท่านด้านการเงิน ให้เงินหรือยืมเงิน บ่อยอย่างไร

- (0) ไม่เคย (1) นานๆ ครั้ง (2) บางครั้ง (3) บ่อย (4) บ่อยมาก

แบบสัมภาษณ์คุณภาพการนอนหลับ (Thai-PSQI)

คำชี้แจง โปรดตอบคำถามที่ตรงกับการนอนของท่านในระยะ 1 เดือนที่ผ่านมา

1. ท่านมักจะเข้านอนในเวลานาฬิกา
2. ท่านมักใช้เวลา นานประมาณนาทีกว่านอนหลับ
3. ท่านมักจะตื่นนอนเวลา.....นาฬิกา
4. A. โดยเฉลี่ยท่านนอนหลับได้คืนละ..... ชั่วโมง
- B. โดยเฉลี่ยท่านใช้เวลาอยู่บนเตียงนอน คืนละชั่วโมง

| | | | | |
|--|------------------------|---------------------------------------|--|---|
| 5. ในช่วง 1 เดือนที่ผ่านมา | ไม่มี เลย 0) | น้อยกว่า 1ครั้ง/ สัปดาห์ (1) | ประมาณ 1-2 ครั้ง/ สัปดาห์ (2) | 3 ครั้ง/ สัปดาห์ หรือ มากกว่า (3) |
| 5.1 ท่านมีปัญหา ไม่สามารถนอนหลับได้ภายใน 30 นาที | | | | |
| 5.2 ท่านมีปัญหา ตื่นกลางดึกหรือตื่นเช้ากว่าปกติ | | | | |

| | | | | |
|--|------------------------|---|--|---|
| 5. ในช่วง 1 เดือนที่ผ่านมา | ไม่มี เลย 0) | น้อยกว่า 1ครั้ง/ สัปดาห์ (1) | ประมาณ 1-2 ครั้ง/ สัปดาห์ (2) | 3 ครั้ง/ สัปดาห์ หรือ มากกว่า (3) |
| 5.3 ท่านมีปัญหา ตื่นเวลากลางคืนเพื่อเข้าห้องน้ำ | | | | |
| 5.4 ท่านมีปัญหา หายใจไม่สะดวก/หายใจขัด จนนอน ไม่หลับ | | | | |
| 5.5 ท่านมีปัญหา กรนหรือไอเสียงดัง จนนอนไม่หลับ | | | | |
| 5.6 ท่านมีปัญหา รู้สึกหนาวเกินไป จนนอนไม่หลับ | | | | |
| 5.7 ท่านมีปัญหา รู้สึกร้อนเกินไป จนนอนไม่หลับ | | | | |
| 5.8 ท่านฝันร้ายจนทำให้นอนไม่หลับ | | | | |
| 5.9 ท่านรู้สึกเจ็บหรือปวดจนนอนไม่หลับ | | | | |
| 5.10 สาเหตุอื่นๆ ถ้ามี ระบุ..... | | | | |
| 6. ในช่วง 1 เดือนที่ผ่านมาท่านใช้ยาเพื่อให้นอนหลับ บ่อยแค่ไหน | | | | |
| 7. ในช่วง 1 เดือนที่ผ่านมา ท่านรู้สึกง่วง ตลอดเวลา ในช่วงกลางวัน หรือเพลอหลับในช่วงทำกิจกรรม ขับ รถ หรือรับประทานอาหาร | | | | |
| 8. ในช่วง 1 เดือนที่ผ่านมา บ่อยแค่ไหนที่ท่านประสบ ปัญหากับการทำกิจกรรมต่างๆ ให้ประสบความสำเร็จ | | | | |
| 9. ในช่วง 1 เดือนที่ผ่านมา คุณภาพการนอนหลับของ ท่านในภาพรวมเป็นอย่างไร | มาก (0) | ดี (1) | ไม่ค่อยดี (2) | ไม่ดีเลย (3) |

แบบประเมินการนอนไม่หลับ

โปรดตอบคำถามเกี่ยวกับการนอนไม่หลับที่ตรงกับการรับรู้ของท่าน ในช่วงหนึ่งเดือนที่ผ่านมา
คำชี้แจง เครื่องหมาย X ตรงกับการรับรู้ของท่านมากที่สุด

1. ในช่วง 1 เดือนที่ผ่านมา ท่านพยายามนอนแต่นอนไม่หลับ
(0) เล็กน้อย (1) ไม่มี (2) ปานกลาง (3) รุนแรง (4) รุนแรงมาก
2. ในช่วง 1 เดือนที่ผ่านมา เมื่อตื่นขึ้นกลางดึกแล้วพยายามนอนต่อแต่กลับนอนไม่หลับ
(0) เล็กน้อย (1) ไม่มี (2) ปานกลาง (3) รุนแรง (4) รุนแรงมาก
3. ในช่วง 1 เดือนที่ผ่านมา ท่านตื่นเร็วเกินไป
(0) เล็กน้อย (1) ไม่มี (2) ปานกลาง (3) รุนแรง (4) รุนแรงมาก
4. ความพึงพอใจกับการนอนในปัจจุบัน
(0) มากทีเดียว (1) มาก (2) บ้าง (3) เล็กน้อย (4) ไม่เลย
5. การนอนไม่หลับส่งผลกระทบต่อการดำเนินชีวิตของท่าน จนคนอื่นๆสังเกตเห็นได้
(0) ไม่เลย (1) เล็กน้อย (2) มีบ้าง (3) มาก (4) มากทีเดียว
6. ท่านรู้สึกกังวลและหดหู่มากเกี่ยวกับการนอนไม่หลับ
(0) ไม่เลย (1) เล็กน้อย (2) มีบ้าง (3) มาก (4) มากทีเดียว
7. ปัญหาการนอนไม่หลับมีผลกระทบต่อการดำเนินชีวิตประจำวันของท่านในระดับไหน
(0) ไม่เลย (1) เล็กน้อย (2) มีบ้าง (3) มาก (4) มากทีเดียว

แบบสัมภาษณ์ ระดับการออกกำลังกาย

คำชี้แจง โปรดตอบคำถามเกี่ยวกับกิจกรรมต่างๆที่ท่านได้ทำไปแล้วในระยะเวลา 7 วันที่ผ่านมา

| ในระยะเวลา 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะเวลา 7 วันที่ผ่านมา | | | | | |
|---|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| หมวดกิจกรรมงานบ้าน | | | | | | |
| 1. ดูแลเลี้ยงเด็ก/ ผู้อื่น เช่น หลาน ผู้ป่วย คนพิการ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 2. เตรียมหรือทำอาหาร <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 3. ล้างจานหรืออุปกรณ์เครื่องใช้ต่างๆ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 4. เช็ดถูพื้น ทำความสะอาดบ้าน ดูดฝุ่น หรือทำความสะอาดห้องน้ำ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 5. ซักเสื้อผ้าโดยใช้เครื่องซักผ้า <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 6. ซักเสื้อผ้าโดยไม่ใช้เครื่อง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 7. รีดผ้า <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 8. ทำความสะอาดหน้าต่าง รางน้ำ ล้างรถยนต์ หรือจักรยาน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 9. อาบน้ำให้สัตว์เลี้ยงหรือ ล้างกรงสัตว์เลี้ยง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 10. ให้อาหารสัตว์เลี้ยง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |

| ในระยะ 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะ 7 วันที่ผ่านมา | | | | | |
|--|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| 11. ซ่อมอุปกรณ์เครื่องใช้ไฟฟ้า หรืออุปกรณ์ต่างๆ ที่เป็นส่วนหนึ่งของบ้าน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 12. ทำงานสวนที่ออกแรงเล็กน้อย เช่น <ul style="list-style-type: none"> • รดน้ำต้นไม้โดยใช้กระบอก สายยาง หรือ ถังน้ำ • ตัดพุ่มไม้เล็กๆ ถอนหญ้ากับมือ กวาด หรือ เก็บใบไม้ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 13. ทำงานสวนที่ต้องออกแรงระดับปานกลาง เช่น <ul style="list-style-type: none"> • ตัดหญ้าด้วยกรรไกรตัดหญ้า หรือเครื่องตัดหญ้า • ปลุกต้นไม้ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| หมวดกิจกรรมงานอาชีพ 14. ประกอบอาชีพที่ต้องออกแรงเล็กน้อย เช่น ผู้บริหาร ผู้ให้คำปรึกษา <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 15. ประกอบอาชีพที่ต้องออกแรงปานกลาง เช่น ครู พ่อค้า ช่างทำผม หมอดูแลคนชรา หมอนวดแผนโบราณ คนขับรถแท็กซี่ ช่างภาพ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 16. ประกอบอาชีพที่ต้องออกแรงมาก เช่น กรรมกร (ยกของหรือแบกของหนัก) <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |

| ในระยะ 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะ 7 วันที่ผ่านมา | | | | | |
|---|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| หมวดกิจกรรมเพื่อผ่อนคลาย: กิจกรรมสร้างสรรค์ 17. กิจกรรมอาสาสมัคร เช่น กิจกรรมชมรม ผู้สูงอายุ ศาสนา อาสาสมัครด้านสุขภาพ หรือ อื่นๆ ทั่วไป <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 18. ปฏิบัติศาสนกิจ เช่น ไปวัด โบสถ์ มัสยิด สวดมนต์ นั่งสมาธิ อ่านคัมภีร์หรือไบเบิล <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 19. เติมน้ำดื่ม หรือปฏิบัติกิจกรรมทางศาสนาที่ต้องลุกยืน-นั่งหลายๆครั้ง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 20. ทำงานประดิษฐ์งานไม้ เย็บปักถักร้อย หรือแกะสลัก <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 21. ใช้คอมพิวเตอร์ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 22. ดูโทรทัศน์ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 23. เล่นเกมส์ที่ออกแรงเบาๆ เช่น ไพ่ บิงโก ตัวต่อ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 24. เล่นเกมส์ที่ต้องออกแรงระดับปานกลาง เช่น บิลเลียด <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 25. ดูคอนเสิร์ต ภาพยนตร์ หรือ ดูกีฬา <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |

| ในระยะ 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะ 7 วันที่ผ่านมา | | | | | |
|---|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| 26. เล่นดนตรี <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 27. เต้นรำ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| หมวดกิจกรรมเพื่อผ่อนคลาย: ออกกำลังกาย | | | | | | |
| 28. เดินเล่น หรือพาสุนัขเดินเล่น <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 29. เดินเร็วเพื่อออกกำลังกาย <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 30. วิ่งจ็อกกิ้ง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 31. ปั่นจักรยาน หรือ ปั่นเครื่องปั่นจักรยาน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 32. ออกกำลังกายโดยวิ่งสายสะพาน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 33. ใช้เครื่องออกกำลังกายแบบแอโรบิคที่ไม่ใช้วิ่งสายสะพาน เช่น เครื่องกรรเชียงบก (rowing machine) หรือ เครื่อง Step-machine <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 34. การออกกำลังกายด้วยมือและท่าทาง (light calisthenics) เช่น รำกระบี่ กระบอง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 35. การออกกำลังกายแบบยืดหยุ่นกล้ามเนื้อ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 36. เล่นโยคะ หรือไทชิ | | | | | | |

| ในระยะ 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะ 7 วันที่ผ่านมา | | | | | |
|--|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 37. เดินแอโรบิก <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 38. การออกกำลังกายเพิ่มความแข็งแรงกล้ามเนื้อ ระดับเล็กน้อย เช่น ดึงสายยางหรือยกน้ำหนัก > 2 กิโลกรัม <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 39. การออกกำลังกายเพิ่มความแข็งแรงกล้ามเนื้อ ระดับปานกลาง เช่น ดึงสายยางหรือยกน้ำหนัก < 2 กิโลกรัม <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 40. เล่นเปตอง หรือ โบลิ่ง <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 41. เล่นเทนนิส <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 42. เล่นกอล์ฟ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 43. ใช้อุปกรณ์เล่นกอล์ฟ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 44. ขับรถสนามกอล์ฟ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 45. เล่นเทนนิสคู่ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 46. เล่นเทนนิสเดี่ยว | | | | | | |

| ในระยะ 7 วันที่ผ่านมา ท่านได้.... | รวมจำนวนชั่วโมงทั้งหมดที่ท่านได้ทำในระยะ 7 วันที่ผ่านมา | | | | | |
|--|---|---------|---------|---------|----------|--------|
| | 0-1 ชม | >1-3 ชม | >3-5 ชม | >5-7 ชม | > 7-9 ชม | > 9 ชม |
| <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 47. เล่นแบดมินตันเพื่อการออกกำลังกาย <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 48. เล่นแบดมินตันเพื่อการแข่งขัน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 49. เล่นบาสเกตบอล หรือฟุตบอล <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 50. ออกกำลังกายในน้ำ หรือว่ายน้ำ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| หมวดการเดินทาง | | | | | | |
| 51. เดินไปขึ้นรถบัส รถไฟฟ้า แท็กซี่ หรือเดินไปทำธุระ ส่งจดหมาย เดินไปซื้อของ เดินส่งลูกไปโรงเรียน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 52. เดินไปทำธุระ/ส่งของพร้อมกับถือของหนักในเวลาเดียวกัน <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 53. ขับจักรยานยนต์ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| 54. ขับรถยนต์ <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |
| หมวดกิจกรรมอื่นทั่วไป | | | | | | |
| 55. กิจกรรมอื่น ที่ไม่ได้ระบุก่อนหน้านี้ ถ้ามีระบุ..... <input type="checkbox"/> ใช่ จำนวนกี่ครั้ง/สัปดาห์..... <input type="checkbox"/> ไม่ได้ทำ | | | | | | |

Appendix F
Permission Letter



School of Nursing
No. 3620
Date: December 21 2015
Time: 3:00 PM.

Faculty of Graduate Studies Mahidol University
999 Phuttamonthon 4 Road, Salaya, Nakhon
Pathom 73170
Tel: (02) 4414125 -109 – 111 Fax: 02441-9834

No. ศบ 0517.02/11376

Date December 18, 2015

Subject Permission to use the research questionnaire

Dear Dean of Faculty of Nursing Prince of Songkla University

Reference ศบ 0521.1.05/2784 **Date** September 5, 2015

In reference to your requesting permission letter as following details:

Researcher name: Ms. Chantra Promnoi, Faculty of Nursing Prince of Songkla University and a current doctoral student at Sinclair School of Nursing, the University of Missouri, U.S.A.

Research details: Sleep quality and physical activity in Thai older adults

Research questionnaire: The self-report physical activity questionnaire

Person developing research instrument: A self-report physical activity questionnaire (SPAQ) among elderly community-dwelling Thais was developed by Vanida Visuthipanich as part of her doctoral dissertation research entitled “Development and Testing of a Physical Activity Questionnaire among Community-Dwelling Older

Thai Adults in Bangkok”, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand, and Associate Professor Dr. Yupapin Sirapongam, the dissertation supervisor.

Faculty of Graduate Studies and Department of Nursing, Mahidol University have considered allowing Ms. Chantra Promnoi to use a self-report physical activity questionnaire” in her research study that is related to academia and acknowledging that this research questionnaire is part of her doctoral dissertation, International Nursing Program and the cooperation with oversea university, Department of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand.

In this regard, I would like to inform you that your request has been approved and can further process.

Yours faithfully



(Waraporn Aukarapatumvong)

Assoc. Prof. Dr., Associate Dean of Academic Affairs

Deputy of Dean of Graduate studies



| |
|-----------------|
| คณะพยาบาลศาสตร์ |
| เลขรับ ๖๖๒๐ |
| วันที่ ๑๖.๑.๕๘ |
| เวลา ๑๕.๐๐ |

บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล
 ๒๕/๒๕ ถนนบรมชนกสราย ๔ ศาลายา นครปฐม ๗๓๑๗๐
 โทร. ๐-๒๕๔๔๑-๕๑๒๕ ต่อ ๓๐๙-๓๑๑ โทรสาร ๐-๒๕๔๔๑-๕๘๗๔

ที่ ศธ ๐๕๑๑.๐๒ / ๑๑๑๗๖
 วันที่ ๑๖ ธันวาคม ๒๕๕๘
 เรื่อง อนุญาตให้ใช้เครื่องมือวิจัย

เรียน ทงนบดีคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์
 อ้างถึง หนังสือที่ ศธ ๐๕๒๑.๑.๐๕ / ๒๗๘๔ ลงวันที่ ๕ ตุลาคม ๒๕๕๘

ตามหนังสือที่อ้างถึง คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ แจ้งว่า
 ผู้ขอใช้เครื่องมือวิจัย : นางสาวจันทรา พรหมน้อย อาจารย์ประจำภาควิชาการพยาบาลคัลยศาสตร์
 คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ อยู่ระหว่างการลาศึกษาต่อระดับปริญญาเอก สาขาการพยาบาล
 ณ มหาวิทยาลัยมิสซูรี ประเทศสหรัฐอเมริกา
 งานวิจัยของผู้ขอใช้เครื่องมือ : "คุณภาพการนอนหลับในผู้สูงอายุที่มาก่อการก้ำกัวย และการประเมิน
 กิจกรรมทางกาย ประกอบกับการประเมินคุณภาพการนอนหลับ ณ ศูนย์ส่งเสริมสุขภาพและฟื้นฟูสภาพผู้สูงอายุ
 คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์"
 เครื่องมือวิจัยที่ขอใช้ : แบบสอบถามกิจกรรมการเคลื่อนไหวออกแรงและการออกก้ำกัวย
 สำหรับผู้สูงอายุไทยในชุมชน
 เครื่องมือวิจัยนี้พัฒนาโดย : นางวนิดา วิสุทธิพานิช ซึ่งเป็นส่วนหนึ่งของวิทยานิพนธ์หลักสูตร
 ปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล (หลักสูตรนานาชาติ) และหลักสูตรร่วมกับมหาวิทยาลัยในต่างประเทศ
 โครงการร่วมระหว่างคณะแพทยศาสตร์โรงพยาบาลรามาธิบดี และคณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล
 พ.ศ. ๒๕๕๓ เรื่อง "การพัฒนาและการทดสอบแบบสอบถามกิจกรรมการเคลื่อนไหวออกแรง และการออก
 ก้ำกัวยสำหรับผู้สูงอายุไทยในชุมชน จังหวัดกรุงเทพมหานคร (DEVELOPMENT AND TESTING OF A
 PHYSICAL ACTIVITY QUESTIONNAIRE AMONG COMMUNITY-DWELLING OLDER THAI ADULTS
 IN BANGKOK)" ซึ่งมี รศ.ดร.ยุพาพิน ศิริโพธิ์งาม เป็นอาจารย์ที่ปรึกษาวิทยานิพนธ์หลัก

บัณฑิตวิทยาลัย และคณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล ได้พิจารณาแล้ว ยินดีอนุญาตให้
 นางสาวจันทรา พรหมน้อย ใช้เครื่องมือวิจัยดังกล่าวได้ เนื่องจากเป็นการศึกษาวิจัยทางด้านวิชาการ แต่
 ทั้งนี้ขอได้โปรดระบุให้ชัดเจนด้วยว่า เครื่องมือวิจัยดังกล่าวมาจากวิทยานิพนธ์ของนักศึกษาระดับ
 ปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล (หลักสูตรนานาชาติ) และหลักสูตรร่วมกับมหาวิทยาลัยใน
 ต่างประเทศ โครงการร่วมระหว่างคณะแพทยศาสตร์โรงพยาบาลรามาธิบดี และคณะพยาบาลศาสตร์

มหาวิทยาลัยมหิดล ถ้าหากมีการละเมิดเกิดขึ้นข้าพเจ้ายินยอมให้ คณะพยาบาลศาสตร์ ดำเนินการตามกฎหมาย
อนึ่งคณะพยาบาลศาสตร์ ได้แนบบแบบฟอร์มหนังสือรับรองการนำผลงานวิจัยหรืองานสร้างสรรค์ไปใช้
ประโยชน์และแบบฟอร์ม พย.ม. ๐๑๔ มาด้วย เพื่อให้ดำเนินการกรอกแบบฟอร์มและส่งคืนไปยัง
สำนักงานหลักสูตรบัณฑิตศึกษา คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล และขอให้ดำเนินการชำระ
ค่าบริการขอใช้เครื่องวิจัยดังกล่าวข้างต้น จำนวน ๒๐๐ บาท (สองร้อยบาทถ้วน) ต่อเครื่องมือวิจัย ๑ ชุด โดยส่ง
ธนาคัติสั่งจ่าย ป.ณ. ศิริราช ในนาม

หลักสูตรบัณฑิตศึกษา (เพื่อการขอใช้เครื่องมือวิจัย)

คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล

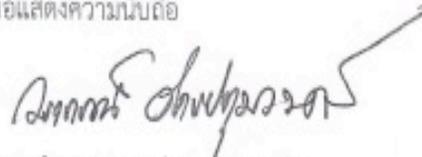
เลขที่ ๒ ถนนวังหลัง แขวงศิริราช

เขตบางกอกน้อย กรุงเทพมหานคร ๑๐๗๑๐๐

โทร. ๐-๒๕๕๔๓-๕๓๓๓ ต่อ ๒๕๕๒-๒๕๕๓

จึงเรียนมาเพื่อโปรดทราบ และดำเนินการต่อไปด้วย จักขอบพระคุณยิ่ง

ขอแสดงความนับถือ



(รองศาสตราจารย์ ดร. วราภรณ์ อัครปฐมวงศ์)

รองคณบดีฝ่ายวิชาการ

ปฏิบัติงานแทน คณบดีบัณฑิตวิทยาลัย

VITA

Chantra Promnoi was born in January 29, 1974 in Lung-Suan District, Chumphorn Province, Thailand. She graduated with Bachelor's degree in Nursing and Midwifery in 1997 and Master's degree in Adult Nursing in 2007 from the Faculty of Nursing, Prince of Songkla University, Thailand. Ms. Promnoi began her clinical nursing career in the female medical ward at Songklanagarind Hospital in Thailand. Then, she held a position as a nursing instructor at the Faculty of Nursing, Prince of Songkla University. In 2012, Ms. Promnoi entered the doctoral program at the Sinclair School of Nursing, the University of Missouri. During her study at the University of Missouri, Ms. Promnoi was awarded the Thailand Development Scholarship from 2012 – 2016, the MU Tiger Scholarship in 2015, and the Fun Drive Nurses Scholarship in 2016.