QUALITY OF LIFE AND FACTORS ASSOCIATED WITH FOOT PAIN IN PRE-RETIREMENT AGED AT CHULALONGKORN UNIVERSITY THAILAND

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คุณภาพชีวิต และปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าในบุคลากรวัยก่อนเกษียณอายุของจุฬาลงกรณ์มหาวิทยาลัย ประเทศไทย

นางสาวภาวิณี หฤทัยชื่น

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต

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Thesis Title	QUALITY OF LIFE AND FACTORS ASSOCIATED WITH FOOT PAIN IN PRE-RETIREMENT AGED AT CHULALONGKORN UNIVERSITY THAILAND
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Field of Study	Public Health
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ภาวิณี หฤทัยชื่น: คุณภาพชีวิต และปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าในบุคลากรวัยก่อนเกษียณอายุของจุฬาลงกรณ์มหาวิทยาลัย ประเทศไทย. (QUALITY AND FACTORS ASSOCIATE WITH FOOT PAIN IN PRE-RETIREMENT AGED AT CHULALONGKORN UNIVERSITY THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ.ดร. รัตนา สำโรงทอง, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ผศ.ดร.ปราณีต เพ็ญศรี, 106 หน้า.

การวิจัยครั้งนี้มีวัตถุประสงค์หลักเพื่อศึกษาปัจจัยที่เกี่ยวข้องกับอาการปวดเท้า ซึ่งประกอบด้วยปัจจัยส่วนบุคคล ลักษณะงาน พฤติกรรมการดูแลสุขภาพ และผลการตรวจประเมินทางกายภาพบำบัดในบุคลากรวัยก่อนเกษียณอายุ และเพื่อเปรียบเทียบระดับคุณภาพชีวิตระหว่างกลุ่มปวดเท้าและกลุ่มไม่ปวดเท้า การวิจัยนี้เป็นงานวิจัยเชิงสำรวจ ณ จุดเวลาหนึ่งของบุคลากรจุฬาลงกรณ์มหาวิทยาลัยที่มีอายุระหว่าง 50-60 ปี โดยใช้เทคนิคการสุ่มตัวอย่างผ่านหน่วยงานภายในมหาวิทยาลัยเพื่อคัดเลือกประชากรเข้าร่วมการศึกษา กลุ่มตัวอย่างทั้งหมด 221 คนที่ผ่านการคัดกรองเข้าร่วมการศึกษา จะถูกแบ่งออกเป็น 2 กลุ่มคือ กลุ่มปวดเท้า และกลุ่มไม่ปวดเท้า นิยามของกลุ่มปวดเท้า คือบุคลากรที่มีอาการปวดเท้าภายในระยะเวลา 1 เดือนที่ผ่านมา และมีระดับคะแนนความสามารถในการทำงานของเท้าตั้งแต่ 1 คะแนนขึ้นไป เครื่องมือที่ใช้ในการศึกษาวิจัยครั้งนี้ ประกอบด้วย แบบสอบถามประเมินตนเอง และการตรวจประเมินเท้าโดยนักกายภาพบำบัด

ผลจากการศึกษาพบว่า ร้อยละ 47.5 ของกลุ่มตัวอย่างเป็นกลุ่มปวดเท้า เมื่อพิจารณาระดับคุณภาพชีวิต พบว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติที่ระดับ .05 ระหว่างกลุ่มปวดเท้า และกลุ่มไม่ปวดเท้า การศึกษาปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าโดยใช้การวิเคราะห์การถดถอยโลจิสติกเชิงพหุแบบขั้นบันได (Backward stepwise method) พบว่า ปัจจัยที่มีความสัมพันธ์กับอาการปวดเท้าที่ระดับนัยสำคัญทางสถิติ .05 ประกอบด้วย ประวัติอาการปวดหลังส่วนบั้นเอว (OR=2.04, 95%CI=1.06-3.95) และปวดเข่า (OR=3.24, 95%CI=1.67-6.31) การยืนทำงานอยู่กับที่เป็นเวลานาน (OR=2.12, 95%CI=0.998-4.49) การมีภาวะนิ้วหัวแม่เท้าเอียงผิดรูป (OR=0.37, 95%CI=0.17-0.79) ภาวะอ่อนแรงของกลุ่มกล้ามเนื้อที่ทำหน้าที่ถีบปลายเท้าลง (OR=3.60, 95%CI=1.17-11.1) และการมีโครงสร้างข้อเท้าที่ผิดปกติชนิดบิดเข้าด้านใน (OR=1.97, 95%CI=0.994-3.92).

ข้อมูลที่เกี่ยวข้องกับประวัติอาการปวดหลังส่วนบั้นเอว และปวดเข่า การยืนทำงานอยู่กับที่เป็นเวลานาน และการมีโครงสร้างข้อเท้าที่ผิดปกติชนิดบิดเข้าด้านใน มีประโยชน์สำหรับการศึกษาในครั้งต่อไป เพื่อป้องกันและหาเทคนิคการรักษาทางกายภาพบำบัดที่มีประสิทธิภาพในการลดอัตราการเกิดโรคทางระบบกระดูกและกล้ามเนื้อบริเวณเท้าในกลุ่มประชากรวัยทำงาน

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต.....

ปีการศึกษา 2555 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม.....

5578810853 : MAJOR PUBLIC HEALTH
KEYWORDS : QUALITY OF LIFE/ FOOT PAIN/ RELATED FACTORS/ OLDER WORKERS/ ANTHROPOMETRY

PAVINEE HARUTAICHUN: QUALITY OF LIFE AND FACTORS ASSOCIATED WITH FOOT PAIN IN PRE-RETIREMENT AGED AT CHULALONGKORN UNIVERSITY THAILAND. ADVISOR: ASST.PROF.RATANA SOMRONGTHONG, Ph.D., CO-ADVISOR: ASST.PROF.PRANEET PENSRI, Ph.D., 106 pp.

The general objectives of the study were to determine the related factors of individuality, occupation, health behavior, and anthropometry to the presence of musculoskeletal disorders at foot region during the past month in pre-retirement aged of Chulalongkorn University personnel, and to compare the scores of physical health and mental health between subjects with foot pain and subjects without foot pain. This research study was conducted as a cross-sectional design on 221 subjects aged between 50 and 60 years at Chulalongkorn University by cluster sampling technique to recruit the sample at each sector. The main outcome variable was foot pain identified by the persons who had foot pain during the last month and had at least 1 score of the Manchester foot pain and disability index (MFPDI). A self-reported questionnaire and a set of physical examinations performed by a physiotherapist were used to collect data about the factors associated with foot pain and health-related quality of life.

47.5% of participants were defined as foot pain group. The significant differences of overall quality of life were found between the participants with foot pain and without foot pain (p-value < 0.001 for SF-12 PCS; p-value = 0.001 for SF-12 MCS). Using backward stepwise logistics regression, various significant factors related to foot pain were found including having previous history of low back pain (OR=2.04, 95%CI=1.06-3.95) or knee pain (OR=3.24, 95%CI=1.67-6.31), prolong standing posture at work (OR=2.12, 95%CI=0.998-4.49), the presence of mild hallux valgus (OR=0.37, 95%CI=0.17-0.79), weakness of ankle plantarflexors strength (OR=3.60, 95%CI=1.17-11.1), and pronated foot type (OR=1.97, 95%CI=0.994-3.92).

Low back pain history, knee pain history, prolong standing, and pronated foot type were important factors associated with foot pain in pre-retirement aged. These findings provide useful information for the development of the prevention strategies for musculoskeletal foot pain in this age group. Future studies to determine the cause-effect relationship between foot pain and those important factors are required.

Field of Study : Public Health ..... Student's Signature……...……..

Academic Year : 2012 ..... Advisor's Signature…….....

Co-advisor's Signature…….....

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This thesis is dedicated with deepest love to my parents. Their love, encouragement and understanding have inspired me to be the best I can be. And I hope this thesis is the best thing that represents my thankfulness to both of them.

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LIST OF ABBREVIATIONS

BMI	Body mass Index
CI	Confidence Interval
FHFS	Foot health functional status
FPI	Foot posture Index
ICC	Intraclass correlation coefficient
IOC	Index of item-Objective Congruence
MCS	Mental component summary
MFPDI	Manchester foot pain and disability Index
MPJ	Metatarsophalangeal joint
MSDs	Musculoskeletal disorders
OR	Odd ratio
PCS	Physical component summary
PGT1	Paper grip test (at great toe)
PGT2	Paper grip test (at lesser toes)
PSI	Pearson-fit separation Index
SAI	Staheli's arch index
SF-12	12-item Short-form health survey
WHR	Waist hip ratio

CHAPTER I

INTRODUCTION

1.1. Background and Rationale

Musculoskeletal disorders (MSDs) are the main public health problems generally found in the working population (Fjell et al., 2005; Hill et al., 2008; Messing et al., 2008; Janwantanakul et al., 2009; Pensri et al., 2009; Werner et al., 2010). Thai health survey from 2003 to 2007 found that the most prevalent illness were respiratory tract diseases (40.9%), musculoskeletal diseases (11.4%), and gastrointestinal diseases (9.4%), respectively. The Surveillance center on health and public health problem (Udomprasertgul et al., 2010) collected data between 2007 to 2009 on Chulalongkorn staff and found that musculoskeletal problem was one of the top ten general health complaints in Chulalongkorn personnel (4.7%) and also be the main cause of sick leave from working (6.3%). In addition, there were increasing the sick leave among the staff in every year since 2007 (4.4%) until 2009 (6.3%). The data collected from Chulalongkorn Health Service Center revealed that the Chulalongkorn University personnel visited doctor with musculoskeletal problems in the highest rates (18.4%) when compared with other diseases or non-communicable diseases (i.e. Hypertension) (Udomprasertgul et al., 2010). The effects of musculoskeletal problems are generalized among workers with many factors consisting of poor posture with high physical workload, prolong sitting posture, prolong standing posture, poor ergonomic control, individual behavior factors, and psychological factors (Poosanthanasarn and Lohachit, 2005; Buranatreved and Sweatsriskul, 2005; Fjell et al., 2005; Hill et al., 2008; Messing et al., 2008; Janwantanakul et al., 2010; Pensri et al., 2010; Werner et al., 2010). The consequence of MSDs mostly affects working performance. In addition, it may contribute to negative effect including economic and psychological problems (Janwantanakul et al., 2006).

There are several studies about work-related with MSDs in Thailand. Previous studies found the high prevalence of MSDs among industrial workers,

agricultural workers, electronic workers, dentists, salesperson workers, and office workers. For example, Poosanthanasarn and Lohachit, (2005), studying MSDs among industrial workers, found that the most health complaint among employees was muscular discomfort (32.2%); it was significant higher than other complaints. The factors associated with MSDs including high physical workload, prolong sitting, prolong standing, repetitive movement, and poor ergonomic control without preventing device could induce injuries or trauma during working (Poosanthanasarn and Lohachit, 2005; Chavalitsakulchai and shahnavaz, 1993). Buranatreved and Sweatsriskul, (2005), studying MSDs among agricultural workers, reported that the farmers had high prevalence of musculoskeletal problems (66.4%) which were caused from the poor posture especially in lifting heavy pumping hoses. The study among electronic workers (Theobald, 2012) also showed that the main health problem of workers was bodily ache (80%) more than eye problem (60%). Chowanadisai et al., (2000), studying MSDs among dentists, found that musculoskeletal diseases (78%) were the main health problems more than percutaneous injuries (50%). The risk factors for muscular pain included the poor prolong posture, repetitive hand movement, and vibration load from medical device. Pensri et al., (2010), studying MSDs among salespersons who worked in department stores, found that prolong standing during the working time period for almost 10 hours per day without the sitting place affected musculoskeletal symptoms especially in the lower extremities part.

Considering in office workers, the prevalence of musculoskeletal disorders commonly found at head/neck region (42%), low back region (34%), upper back region (28%), wrists/hands region (20%), shoulders region (16%), ankles/feet region (13%), knees (12%), hips (6%), and elbows (5%), respectively (Janwantanakul et al., 2008). Janwantanakul et al., (2008) showed that prolong sitting and high computer use with uncomfortable posture were the important factors that could affect commonly pain at the spine regions. Furthermore, the workers who reported low level of job dissatisfaction in psychological factors showed the association with the prevalence of spine regions pain (Janwantanakul et al., 2009). The prolong sitting posture affected the highest prevalence of head/neck

pain (42%) (Janwantanakul et al., 2009), while the prolong standing affected the highest prevalence of ankles/feet pain (35%) (Pensri et al., 2009).

Musculoskeletal diseases are commonly found on Chulalongkorn staff (18.4%) when compared with other diseases. Previously, there were some studies investigated MSDs at spine region among young staff and middle-age staff. However, few studies focused on the pre-retirement age staff which is the first step that turns to be aging.

The situation analysis of aging population in Thailand report (Somrongthong and Yamarat, 2011) found that the numbers of aging population had been increasing in every year since 1990 (11.5%) until 2010 (15.3%) and there is a tendency to increase in the future with a prediction of approximately 15.3% in 2020. The consequence of increasing numbers of aging population in every year leads to the decreasing rate of working population and can affect the difficulty to the management systems to provide public utility including the health service insufficiency. According to the report about aging diseases, the result showed the top three diseases commonly found in aging group with the sum among three diseases over 50% (54.9%) consisting of cardiovascular disease, endocrine system disease, and musculoskeletal disease, respectively.

The most common musculoskeletal problems among older adults were found in the knee region because of the degenerative disease and foot problem (Hill et al., 2008; Pensri et al., 2009; Messing et al., 2010; Werner et al., 2010). Foot pain was commonly found in the older group with the prevalent rate of approximately 20-37% among community-dwelling older adults (Dunn et al., 2004; Golightly et al., 2010; Thomas et al., 2011). There was high prevalence of foot pain among the working population aged 50 and above (Hill et al., 2008; Messing et al., 2010; Werner et al., 2010). The main risk factors included poor working posture, general shoewear, abnormal foot type, and undistributed weight of plantar pressure relating to the weakness of foot and ankle muscles. In addition, toe flexor muscles weakness could reduce the control of body weight shifts during walking attributed to the slow speed of walking. The effect of slow walking speed increased plantar pressure especially in toes region which affected both foot pain and the risk of falling

(Dawson et al., 2004; Tencer et al., 2004; Dufour et al., 2009). Consequently, foot pain can cause the low level of quality of life among older adults (Werner et al., 2010; Mickle et al., 2011).

Epidemiological information is useful to prevent older workers from occupation-related injury; however, to the best of our knowledge, studies in musculoskeletal disorders at foot region are very few at present. In previous studies, they used only self-reported questionnaires among the working population and there were no physical assessment of the foot structure (Garrow et al., 2004; Hill et al., 2008; Messing et al., 2008; Werner et al., 2010) Therefore, the present researcher wanted to conduct the study in an older worker group, using the Chulalongkorn University as the selected area since almost 35 percentage of all Chulalongkorn University personnel are more than 50 years old. Moreover, a previous study of musculoskeletal disorders (MSDs) at spine region revealed that Chulalongkorn University personnel had a high prevalence of MSDs (Pensri et al., 2012).

This is the first study of musculoskeletal foot pain among an older working population. Therefore, the aims aims of this study were to examine the prevalent rate of MSDs at foot region during the past month in pre-retirement aged of Chulalongkorn University personnel, and to explore the consequence of foot pain with regard to the overall quality of life, as well as to determine the relationship between various factors of individuality, occupation, health behavior, and anthropometry and the occurrence of foot pain in this sample group.

1.2. Research Questions

- What is the prevalence of foot pain during the past month in pre-retirement aged measured by self-reported questionnaire?
- Are there the associations among individual factors, work-related physical factors, health behavioral factors, anthropometric factors and the presence of MSDs during the past month at foot region?
- Are there significant differences in physical health scores and mental health scores between subjects with foot pain and subjects without foot pain?

1.3.Research Hypotheses

- There are the associations among individual factors, work-related physical factors, health behavioral factors, anthropometric factors and the presence of MSDs during the past month at foot region.
- There are significant differences in physical health scores and mental health scores between subjects with foot pain and subjects without foot pain.

1.4. Research Objectives

- To present the frequency of MSDs at foot region in pre-retirement aged at Chulalongkorn University.
- To describe the factors associated with foot pain.
- To explore the associations among individual factors, work-related physical factors, health behavioral factors, anthropometric factors and the presence of MSDs during the past month at foot region.
- To compare the scores of physical health and mental health between subjects with foot pain and subjects without foot pain.

1.5. Conceptual Framework

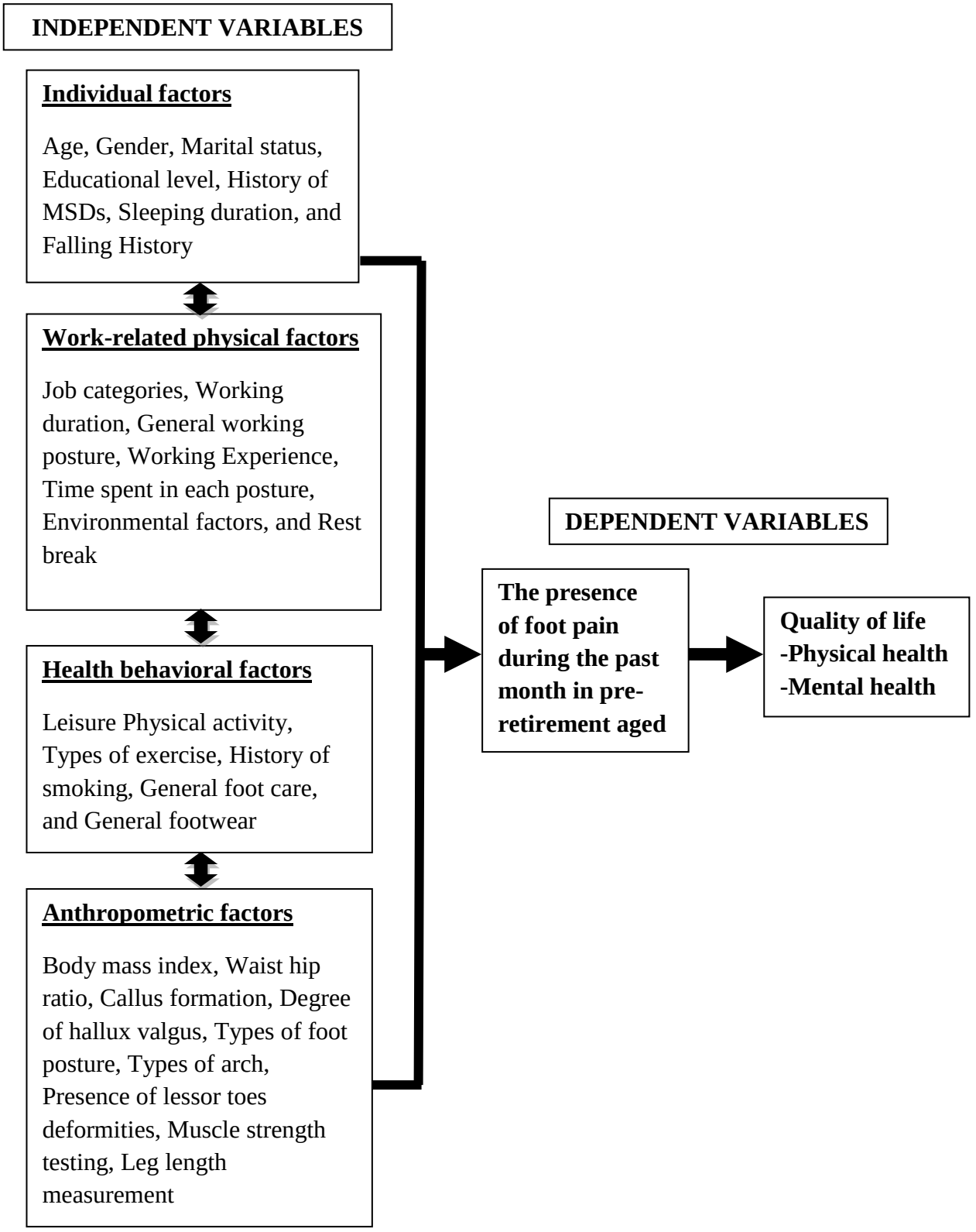


Figure 1: Conceptual Framework of the present study

1.6. Operational Definitions

From the present of study, the following terms are defined as:

1.6.1 Pre-retirement aged means people with aged range between 50 and 60 years who have not stopped employing completely from the workplace (Manorath and Maton, 2009; Chuenchoksan and Nakornthab, 2008).

1.6.2 Foot pain means the persons who have foot pain during the last month and have at least 1 score of the Manchester foot pain and disability index (MFPDI); therefore, the persons who have no foot pain during the last month and have 0 score of the MFPDI are defined as the subjects without foot pain (Garrow et al., 2000).

1.6.3 Quality of life refers to the scores of mental component summary (SF-12 MCS) and physical component summary (SF-12 PCS) using the 12-item short-form health survey (SF-12) questionnaire in Thai version.

1.6.4 Individual factors refer to age, gender, marital status, education level, history of MSDs in other areas (low back, hip/thigh, knee, and foot pain), sleeping duration, and falling history.

a) Age means the numbers of year that someone has lived.

b) Gender refers to male and female.

c) Marital status refers to the current marital status of the pre-retirement aged which divided into single, married, widowed, divorced, and separated.

d) Education level means the highest level of education which divided into secondary school, high school, diploma, undergraduate, and post-graduate.

e) History of MSDs means the regions of body with ache, pain and discomfort more than 1 day during the last 12 months (Kuorinka et al., 1987).

f) Sleeping duration means self-reported approximately time for sleeping (Janwantanakul et al., 2009).

g) Falling history means the people who have ever been falling at least 1 time for the last 12 months (Spink et al., 2011).

1.6.5 Work-related physical factors refer to the job categories, working experience, general working posture, time spent in each posture, environmental factors, and time break duration.

a) Job categories mean the current position of someone.

b) Working duration refer to the avarage time for working (hours per week).

b) Working experience means the numbers of year that someone works in that workplace.

c) General working postures affected foot pain refer to prolong sitting, prolong standing, lifting (more than 5 kg), walking for long distance (more than 2 km), and stair climbing.

d) Time spent in each posture refers to the duration for each working posture which divided into walking, standing, and walking.

e) Environmental factors refer to enough lighting, no disturbing voice, appropriate temperature, and good air ventilation.

f) Time break duration refers to the duration of time without working.

1.6.6 Health behavioral factors refer to leisure physical activity, types of exercise, history of smoking, general footwear, and general foot care.

a) Leisure physical activity refers to the continuously body movement at least 30 minutes until fatigue level (or high energy intake level). The exercise should be carried out about 30 minutes for 3-5 times per week (WHO, 2012).

b) Types of exercise are divided into weight-bearing and non weight-bearing exercise.

c) Smoking history refer to the smoker and non-smoker persons.

d) General footwear refer to the components of heel counter softness, adjustable fixation, normal heel height, sole flexion point, firm insole, and appropriate size (Menz and Sherrington, 2000).

e) General foot care refer to self-foot assessment, nail care, foot cleaning and soaping, socking use, lotion/oil care, foot massage, and general foot exercise to increase range of motion and improve muscle strength.

1.6.7 Anthropometric Variables refer to the physical examinations consisting of body mass index, waist hip ratio, foot problem assessment, foot posture index, types of arch, foot muscles strengths, and leg length measurement.

a) Body mass index (BMI) means the proportion between weight and height (kg/m^2) to determine the degree of body mass index into 4 levels consisting of (WHO, 2008)

- Less than 18.5 kg/m^2 : Underweight
- Between 18.5 to 24.9 kg/m^2 : Normal
- Between 25.0 to 29.9 kg/m^2 : Overweight
- More than 29.9 kg/m^2 : Obesity

b) Waist hip ratio (WHR) means the proportion between waist circumference and hip circumference to determine the abdominal obesity into 2 levels i.e. “Yes” for the female with WHR more than 0.85 and male with WHR more than 0.90; and “No” for the persons with WHR less than the cutting point (WHO, 2008).

c) Foot problem assessment consists of the presence of callus, lessor toe deformities, and hallux valgus deformities (Menz et al., 2001).

d) Foot posture index is used to predict the foot postures consisting of normal foot, pronated foot, highly pronated foot, supinated foot, and highly supinated foot (Keenan et al.,2007).

e) Staheli’s arch index (SAI) is used to predict the types of foot arch consisting of normal foot, flat foot, and high arch foot (Staheli et al., 1987).

f) Foot muscles strengths refer to the strength of extrinsic and instrinsic foot muscles (Keysor et al., 2005; Menz et al., 2006).

g) Leg length measurement refers to the distance from the greater trochanter to the floor in standing position (Wilken et al., 2012).

CHAPTER II

LITERATURE REVIEW

2.1. Definition of foot pain

Foot pain is usually defined as pain, aching or stiffness in these areas: forefoot, toes, hind foot, nails, ball, heel and arch of foot (Hill et al., 2008; Dufour et al., 2009).

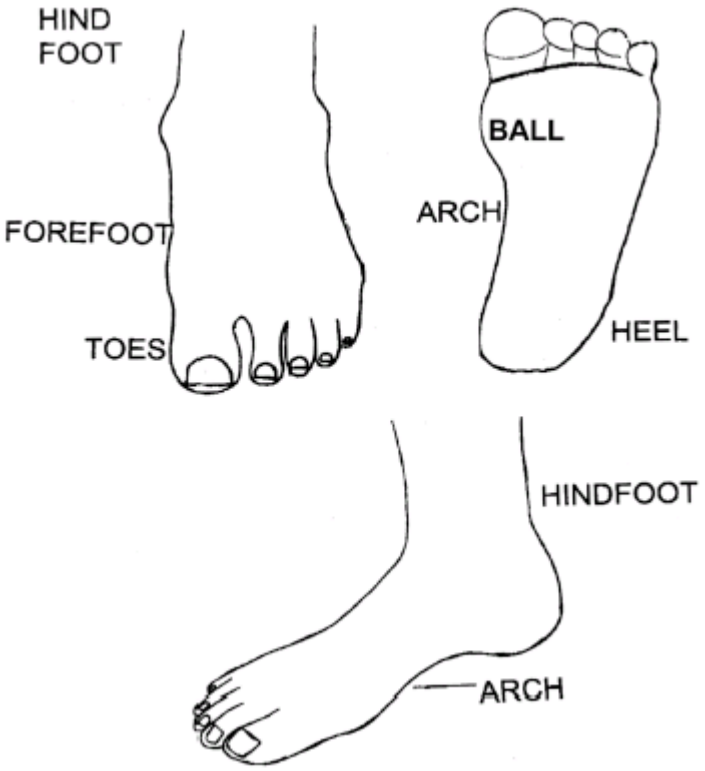


Figure 2: Localized areas of foot pain
(Hill, et al., 2008)

The Manchester foot pain and disability index (MFPDI) was used to assess the severity and impact of foot pain by 3-point scales in each item consisting of none of the time (0 score), on some days (1 score), and on most/every day (2 scores). It had 17 items consisting of functional limitation part (10 items), pain intensity part (5 items), and personal appearance part (2 items). The sum scores of MFPDI varied from the minimum of 0 score to the maximum of 34 scores (Garrow et al., 2000).

The MFPDI was the appropriate tools to evaluate foot pain in clinical and community population including older adults group (Menz et al., 2006; Roddy et al., 2009; Mickle et al., 2011; Spink et al., 2011) because it was found to have high degree of internal consistency (Cronbach's alpha = 0.99). Garrow et al., (2000) defined the subjects with foot pain as the persons who had foot pain during the last month and had at least 1 score of the MFPDI; therefore, the persons who had no foot pain during the last month and had 0 score of the MFPDI were defined as the subjects without foot pain.

The present study used Thai-MFPDI questionnaire. It was measured the test-retest reliability after doing cross cultural adaptation of foot disability questionnaire by Yamsri and Pensri, (2011); the result showed excellent reliability of the questionnaire with the intraclass correlation coefficient (ICC) of 0.96.

2.2. Definition of pre-retirement aged

Pre-retirement age group are the persons between 50 and 60 years of age who have not been stopped employing completely from the workplace (Chuenchoksan and Nakornthab, 2008; Manorath and Maton, 2009).

2.3. Prevalence of foot pain in pre-retirement aged

Foot pain is an important public health issue in older adults because there are increasing the numbers of older persons who are suffering from foot pain in every year (Rao et al., 2012). Foot pain affected about 20-37% among adults with aged over 45 years old (Dunn et al., 2004; Golightly et al., 2011; Thomas et al., 2011). The previous studies showed the higher prevalence of foot pain in older adults among general population. For example, the study of Hill et al., (2008) among general population of the North West Adelaide, found that the people with the highest ratio of foot pain were on aged over 75 years (26.4%), 65-74 years (26.2%), 55-64 years (24.5%), 45-54 years (21.5%), 35-44 years (10.7%), and 20-34 years (10.2%), respectively. Similarly, the study of Messing et al., (2008) among general working population of the Quebec, found that the people with aged between 50 to

65 years have higher significance of foot pain than other age ranges (odds ratio varying from 1.36 to 2.53). The higher prevalence of foot pain was also found in the women group (11.0%) more than men group (8.3%) (Messing et al., 2008).

2.4. Pathophysiology of foot pain

The aetiology of foot pain is widely accepted to be multi-factorial. Increasing age is one of the main factors to induce foot pain because of the weakness of foot and ankle muscles. In addition, toe flexor muscles weakness will reduce the control of body weight shifts during walking which attributed to the slow speed of walking. The effect of slow walking speed increased high plantar pressure especially in toes region which affected both foot pain and the risk of falling in older adults (Hill et al., 2008). Furthermore, the work-related with foot pain are also found in higher proportion among working population (Hill et al., 2008; Messing et al., 2008; Werner et al., 2010). The previous studies revealed the significant association among high physical workload, prolong standing and foot pain. The possible explanation is that poor posture (i.e. prolong standing) can induce musculoskeletal diseases. The continuous loading to muscular structure causes the repetitive injury on the affected area with insufficient time for natural healing process, resulting in the chronic musculoskeletal problems (Wilson et al., 2002; Meijsen et al., 2007).

2.5. Quality of life

Several previous studies found the low level quality of life among older adults with the persistence of foot pain. For example, Hill et al., (2008) found that the persons with foot pain had significant lower scores in all items of health-related quality of life (SF-36) (i.e. physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotion, and emotional health) than the persons without foot pain. Similarly, the study of Mickle et al., (2010) found the lower scores in people with foot pain. The scores of quality of life have been related

with functional capacity which have tendency to decrease in the older age (Mickle, et al., 2010).

The present study used 12-item short-form health survey (SF-12) Thai version (Chariyalertsak et al., 2011) which were developed from the RAND-36 item health survey (SF-36) by Ware et al., (1996); they found the correlations of 0.76 and 0.89 from the reliability tests in the 12-item Mental component summary (MCS) and the 12-item Physical component summary (PCS), respectively. In addition, the validity tests for the SF-12 MCS and the SF-12 PCS have the range from 0.60 to 1.07 (median = 0.97) and the range from 0.43 to 0.93 (median = 0.67), respectively. The result showed the closely mirrored MCS and PCS measures for the RAND-36 item health survey. Considering the study of Chariyalertsak et al., (2011), they found that SF-12 Thai version have the high internal consistency coefficients of 0.76 equally both of the SF-12 MCS and the SF-12 PCS. The sum scores of each component varies from the minimum of 0 score to the maximum of 100 scores. The previous study revealed that the scores less than 50 represented below-average physical or mental health (Wilson, 2002).

2.6. Factors associated with foot pain

2.6.1 Individual risk factors

a) Age

Age is an important risk factor of foot pain. Increasing age is associated with foot pain (Hill et al., 2008). The previous studies found that aged more than 50 years had significant association with foot pain in older adults (Hill et al., 2008). The main cause of foot pain in older adult aged may be involved with the weakness of foot and ankle muscles. In addition, toe flexor muscles weakness will reduce the control of body weight shifts during walking attributed to the slow speed of walking. The effect of slow walking speed increases plantar pressure especially in toe region which affected both foot pain and the risk of falling in older adults (Hill et al., 2008).

Werner et al., (2010) conducted a study in 407 workers at automotive engine manufacturing plant from five job categories (assembly, admin and engineers, machinists, skilled trades, drivers) in Michigan. They found that the workers with aged over 50 years reported foot pain more than younger workers. Similarly, Messing et al., (2008) found that the working population in Quebec, Canada with aged over 50 years had high significant association (odds ratios varying from 1.72 to 3.97) with ankle or foot pain than other age groups (18-24 years, 25-39 years, and 40-49 years).

Furthermore, the prevalence of localized foot pain is also different in each age group. Hill et al., (2008) found that older group with aged over 55 years had higher prevalence of forefoot and toe pain than younger group. Foot pain in older group may be caused by the deformities and calluses with high plantar pressure areas (Mickle et al., 2010).

b) Gender

Several previous studies have shown that women are higher risk of foot pain than men (Messing et al., 2008; Hill et al., 2008; Werner et al., 2010). Roddy et al., (2011) studied in UK community-dwelling older adults with aged over 50 years and found that the onset of disabling foot pain after 3 years had significant increasing in female but there was no significance in male. The types of shoewear were the main factors affected foot pain in older women (Dawson et al., 2004; Dufour et al., 2009). Dufour et al., (2009) found the association between hind foot pain and the past shoewear. The women who reported the poor shoewear style had higher numbers than the men. Shoewear with heel height more than 2.5 cm affected high plantar pressure which induced foot pain and the risk of falling in older women (Tencer et al., 2004; Mickle et al., 2010).

c) Educational level

Dawson et al., (2002) studied in 127 women with aged 50-70 years. They interested in the educational level and set this factor to be one of the independent variables in the study. They found that there was no significant association between educational level and foot problems. Few evidences studied the

relation between education level and ankle/feet pain. For example, Andersen et al., (2007) studied among workers from industrial and service companies. They found that the low educational level increased onset of hip, knee, and foot pain more than medium educational level and high educational level, respectively.

d) History of MSDs in other areas

Musculoskeletal disorders in body regions especially lower back, hip/thigh and knee pain have an effect on foot pain. There were high prevalence of distal lower-extremity pain (including knee pain, hip/thigh pain and foot pain) among the workers with prolong standing posture (Messing et. al., 2008). The previous studies explained the mechanism of lower-extremities pain from prolong standing posture that the static contraction without mobility during prolong standing caused the lower-extremities muscles fatigue (Iridiastadi et al., 2006) and also affected the venous disorders from blood pooling to lower extremities (Tuchsen et al.,2005).

Several studies found the association between foot pain and other body regions. For example, Hill et al., (2008) found the significant association (p-value <0.001) between foot pain and other joint pains, including lower back, hip, and knee pain. Similarly, Badlissi et al., (2005) adjusted the history of lower back pain, hip pain and knee pain variables as confounding factors in the model to analyze the association between foot health functional status (FHFS) and foot musculoskeletal disorders. As a result, the foot pain may be the cause of generalized body regions pain in the form of osteoarthritis (Garrow et al., 2004)

e) Sleeping Duration

The previous studies showed the association between sleeping duration and musculoskeletal problems. For example, the study of Edwards et al., (2008), found the association between musculoskeletal pain and sleeping duration less than 6 hours or more than 9 hours. Furthermore, there were also the studies about sleeping quality and foot pain. For example, Janwantanakul et al., (2009) studied among office workers and found that there was significant association between foot pain and poor sleeping quality.

f) Falling History

The definition of fall is “the posture with resting on the floor unintentionally with intrinsic muscle activities (Tinetti et al., 1998; Lord et al., 2003). Mickle et al., (2010) categorized the participants with aged more than 60 years into 2 groups which consisting of non-fallers (never fall for the last 12 months) and fallers (have at least 1 time of falling for the last 12 months). The mechanism of falling is caused from the reduction of foot muscle strengths in older adults and induces the stability problem of the shifting weight during walking (Mickle et al., 2011). In addition, the main factors increase falling risk of older people consisting of foot pain, poor balance, total plantar pressure, and types of shoewear.

Falling incidence is mostly found in the older people with foot pain. Badlissi et al., (2005), studied in older persons and found that the types of foot musculoskeletal disorders (i.e. toe deformities, abnormal arch) affected the history of multiple falls. The higher peak pressure and pressure-time integral values at 1st metatarsal head and heel are mostly found in the older adults with foot musculoskeletal disorders which caused the poor balance and coordinated stability led to the risk of falling in older adult (Mickle et al., 2011).

Furthermore, there were several previous studies about the association between falling risk and types of shoewear. For example, Tencer et al., (2004) reported that the shoes with high heel and lesser contact area were higher risk of falling in the older adults. Similarly, Dufour et al., (2009) studied the property of each item and found that the poor shoes such as high-heeled shoes, sandals and slippers had high risk of falling because of the instability structure and lack of support.

2.6.2 Work-related physical factors

a) Job category

Various job categories affect different prevalence of foot pain. Werner et al., (2010) studied at manufacturing plant in Michigan among 407

workers. They found that machinists and drivers had the highest prevalence of ankle or foot pain (63%), the next were assembly (54%), admin and engineers (48%), and skilled trades (38%), respectively. Dawson, et al., (2004) found the association between foot pain and regularly lifting in the occupational activities ($p = 0.03$). As a result, there were association between the occupational postures and foot pain (Dawson et al., 2004; Messing et al., 2008).

b) Working experience

Few evidents studied about time working in the current position. The senior workers had a tendency to presence foot disorders. Werner et al., (2010) found that the workers with time working more than 20 years had higher significance of foot disorders occurrence (82%) than the workers with time working 11-20 years (11%) and 0-10 years (7%), respectively. Similarly, Dawson et al., (2004) found the higher foot pain in the workers with time spent for lifting activities over 30 years than the workers with time spent less than 30 years.

c) Working duration

The previous studies investigated working duration as the risk factors for foot pain. For example, Messing et al., (2008) found that working duration more than 36 hours per week had significant association with high prevalence of foot pain. Pensri et al., (2010) studied the association between working duration and foot pain among saleswomen in Thailand. They found that working duration more than 10 hours per day increased the risk of foot pain. The longer working time can induce musculoskeletal diseases because the continuous loading to muscular structure causes the repetitive injury on the affected area without sufficient time for natural healing process, resulting in chronic musculoskeletal problem. (Wilson et al., 2002; Meijsen et al., 2007).

d) General working posture

General working posture is the main risk factor for work-related with foot pain. Several studies focused on the relationship of foot pain with general posture in the working time. For example, Messing et al., (2008) studied among

general working population. They found that fixed standing posture had higher risk for foot pain (odds ratio varying from 2.56 to 6.10). The saleswomen with static posture of standing also have the association with the risk of foot pain (Pensri et al., 2010). Furthermore, the high physical work load is defined as the potentially risk for musculoskeletal disorders. General physical loading such as lifting more than 5 kg and walking more than 2 km has significantly increased MSDs (Wiktorin et al., 1993). Fjell et al., (2007) found that forward-bending position, twisted position, and lifting had significant association with the prevalence of musculoskeletal pain. Similarly, Pensri et al., (2010) found the association between lower extremity pain and lean forward bending, stair climbing, heavy objects pulling, and body twisting. The positive relation were found in the study of Messing et al., (2008) and Andersen et al., (2007) that heavy loads lifting and repetitive movements had significantly increased the risk of foot pain. The poor working posture induced higher load and caused the injury to the lower extremities region, resulting in development of musculoskeletal diseases (Meijsen et al., 2007).

e) Time spent in different postures

Previous studies showed the increasing risk of foot pain in workers. Regularly working in static posture increases the risk of foot pain. Pensri et al., (2010) found that prolong standing in saleswomen more than 10 hours per day have significant association with foot symptom. Similarly, there were association between prolong sitting and lower extremity pain in office workers (Janwantanakul et al.; 2009). The positive relationship was also found in the study of Messing et al., 2008; there were association among prolong standing, general walking for long distance and foot pain in Quebec working population. Prolong standing and walking caused the workload of leg, pelvic, back muscles which were the important structures to maintain balance and posture. The continuous bearing forces to lower extremities induced high pressure and injury to the joints. (Wilson, 2002; Meijsen et al., 2007).

f) Working environment

Previous studies showed that physical working environment were the main risk factors induced musculoskeletal pain. For example, Janwantanakul et al., (2009) studied among office worker and found that the environment conditions such as temperature, noise, air flow, and lighting had directly affected musculoskeletal pain with lower extremity region. Similarly, Pensri et al., (2010) also found the association between self-perception of environment conditions and lower extremities pain. The temperature and lighting had significant association with lower extremities pain.

g) Rest break

The time break during working for long time period can reduce musculoskeletal pain (Dababneh et al., 2001; Tucker et al., 2003; Rogers et al., 2004; Tucker et al., 2006; Janwantanakul el al., 2009; Pensri et al., 2009). The study of Tucker et al., (2006) found that the accumulation of sustain activities more than 2 hours increased the risk of musculoskeletal pain; therefore, rest break duration at least 10 minutes after 2 hours of continuous working can reduce the occurrence of MSDs. The study of Pensri et al., (2009) among saleswomen in Thailand found the significant association ($p<0.012$) between foot pain and hardly rest break. The rest break are very important for the workers with prolong static pressure. The continuous loading to the joint especially in knee region and foot regions induced pain and injury to the joints (Wilson, 2002; Meijsen et al., 2007).

2.6.3 Health behavioral factors

a) Leisure physical activity

Few studies reported the association between foot pain and physical activity. The previous studies showed that workers with sedentary physical activity had significantly increased lower-leg or calf pain (odds ratio varying from 1.09 to 2.00) more than the workers with leisure physical activities at least 20 minutes per time (Messing et al., 2008). There was no study reporting significant difference

between level of physical activities and foot pain. However, Hill et al., (2008) studied in the South Australia and found that there was the higher percentage of foot pain subjects with sedentary physical activity (20.8%) than the foot pain subjects with some level of activity (16.4%). Similarly, Werner et al., (2010), the studying in Michigan, reported that the workers without foot diseases had higher percentage of regularly exercise (67%) than the workers with foot pain (64%). As a result, there was no significant difference between physical activity and foot pain in the previous studies because some kinds of physical activities may affect the physical loading to foot muscles which are the main risk factors of foot pain. There was no report about the association between different types of leisure physical activities and foot pain.

b) Smoking habit

Current cigarrete smokers have higher risk for musculoskeletal disorders than non-smokers. Andersen et al., (2007) studied with general working population in Western Denmark and found the higher prevalence of hip, knee, foot pain in smokers. Similarly, Fjell et al., (2007) studied with employee in the Swedish public sectors and found the significant association between musculoskeletal disorders and smokers both men and women (men odds ratio varying from 1.1 to 6.2, women odds ratio varying from 1.1 to 1.8). Smoking is the cause of general damage to musculoskeletal tissues (i.e. cramp in calf muscles, numbness of hands and feet) through vasoconstriction, hypoxia, defective fibrinolysis or other mechanisms that impair their nutrition circulating to the distal of hands and feet (Leino-Arjas, 1998).

However, the opposite effects were found in the previous studies involved with foot pain. For example, Dufour et al., (2009) studied the association between smoking status and foot pain among older adults with aged more than 50 years. The authors found that current cigarette smoker, former smoker, and nonsmoker had no significant difference with the prevalence of foot pain. Similarly, Werner et al., (2010) studied among the assembly plant workers and found that the workers with and without current smoking had no significant difference in foot

discomfort. However, the result showed the higher proportion in smoking workers with foot disorders (21%) than smoking workers without foot disorders (15%).

c) General footwear

General types of footwear are important factors to affect foot problems. The appropriate footwear can reduce foot pain and the risk of falling in older adults (Menz and Sherrington, 2000). Menz and Sherrington, (2000) considered the components of suitable footwear which were composed of heel counter softness, adjustable fixation, normal heel height, sole flexion point, firm insole, and appropriate size. Dufour et al., (2009) categorized the types of shoewear into 3 groups which consisting of

- The “Good” groups were low-risk shoes with softer out-sole, mid-sole, firm of contact surface and rigid heel counters such as casual sneaker and athletic shoe.

- The “Average” groups were mid-risk shoes such as Rubber sole shoe, work boot, cowboy boot, hard soled leather shoe, and special shoe.

- The “Poor” groups were high-risk shoes without support and stability structure such as high-heeled shoes, sandal, and slipper.

The “Good” shoes decreased the risk of foot pain. Dufour et al., (2009) found the significant difference of hind-foot pain between the good shoes and the average shoe (p-value = 0.022). There was no significant difference of hind foot pain between the average shoe and poor shoe because few subjects reported the poor shoewear in general. Dawson et al., (2004) reported the past shoewear with the highest heel worn regularly for going out socially and for work led to the foot problems in older women. The past shoewear worn regularly with heel height over 2.5 cm caused the formation of plantar calluses and hallux valgus in older women (Menz et al., 2005). The high-heeled shoes decreased the plantar contact area. The body weights distributing to foot were not equally in each region which caused appearance of foot pain especially in hind foot region (Dufour et al., 2005). Furthermore, the lower sole/surface contact area in high-heeled shoes decreased the

stable base of support led to the incidence of falling in older adults (Tencer et al., 2004). As a result, safe shoe can prevent the risk of falling in older people.

d) General foot care

Foot problems are often found in older adults. General self-foot care can reduce the risk factors for foot pain and falling problem in older adults (Mitty, 2009; Spink et al., 2006). The podiatry care which consisted of appropriate foot wear/orthotics, foot exercise program, callus care, and skin care decreased the prevalence of falling and disabling foot problems in older adults (Spink et al., 2006). The older adults with improper shoe wearing induced the toe deformities problems, callus formation, and balance problem (Chaiwanichsiri et al., 2008). The previous studies showed the decreasing of foot pain among older adults with general self-foot care (Frey, 2000; Spink et al., 2006; Wilson et al., 2008; Chaiwanichsiri et al., 2008). Therefore, foot care program for preventing falling and decreasing foot pain are necessary to decrease general foot problems among older adults.

2.6.4 Anthropometric Variables

a) Obesity Index

Obesity is the main risk factor which directly affected foot pain. The increasing BMI especially in the obese group (BMI $\geq$ 30 kg/m2) have significant association with foot pain in the working population (Messing et al., 2008). Similarly, Hill et al., (2008) found the significant association between obese group and prevalence of foot pain (odds ratio varying from 1.57 to 2.31) using the measurement of body mass index and waist hip ratio. The previous studies (Hodge et al., 1999; Mickle et al., 2010; Spink et al., 2011) showed the association between foot pain and plantar pressure. Increasing body weights causes the high plantar pressure which induces foot pain in older adults (Menz et al., 2006).

Conversely, a few previous studies showed the opposite effect. For example, Dawson et al., (2004) conducted the study in older women with aged 50-70 years and found that the higher risk of corn/callus information were found in

lower body mass index women. Werner et al., (2010) found that there was no significant association between high prevalence of foot pain and obesity. However, the study showed the inclination of foot pain incidence higher in the heavier group.

b) Foot problem assessment

Foot problems affected older people up to 80% (Benvenuti et al., 1995; Kruizinga et al., 2002; Keysor et al., 2005). The previous studies showed the association between foot pain and foot problems (Dunn et al., 2004; Badlissi et al., 2005). Foot problem assessment followed by the study of Menz et al., (2001) consisted of the presence of callus formation, lesser toe deformities (claw toe, hammer toe, mallet toe), and hallux valgus deformities (the deviation of big toe caused the protrusion of the first metatarsophalangeal joint which can induce pain and discomfort at that area) which were composed of three levels using the Manchester scale i.e. mild, moderate, and severe (Garrow et al., 2001). The presence of toe deformities increased plantar pressure in specific area and directly related to the hyperkeratotic lesions especially under the 2nd MPJ which were found to be the most common area (Merriman et al., 1987; Spink et al., 2009). The effects of foot problems were more likely to have foot pain in older people (Benvenuti et al., 1995; Menz et al., 2007).

c) Foot posture Index (FPI)

The foot posture was assessed by the study of Redmond et al., (2006). The scores from FPI indicated the types of foot which consisting of pronated foot, supinated foot, and neutral foot. There were significant associations between abnormal foot posture and subjects with foot pain from the previous studies (Sneyers et al., 1995; Burns et al., 2005; Crosbie et al., 2006; Irving et al., 2007). FPI was found to be suitable for clinical assessment with good internal construct validity in the finalized version of FPI-6 after re-analyzing FPI-8. Good item-trait interaction was shown on the data presenting good overall fit in the mode. The pearson-fit separation index (PSI) and Cronbach's alpha had the good internal consistency with the measurement (PSI= 0.88; Cronbach's alpha = 0.87) (Keenan et

al., 2007). The study of Morrison and Ferrari, (2009) also showed the high inter-rater reliability of the test (Kappa analysis = 0.06).

d) Staheli's arch Index (SAI)

The previous studies showed the association between abnormal arch and foot pain (Garrow et al., 2004; Badlissi et al., 2005; Hill et al., 2008). SAI was first described by the study of Staheli et al., (1987). The previous studies used SAI to measure the types of arch from footprint analysis (Gross et al., 2011; Mahdi and Mahmood, 2006; Hernandez et al., 2007; Janchai et al., 2008). The study of Papuga and Burke, (2011) showed the highest interrater reliability of SAI with ICC of 0.975 among other measurement tools for footprint analysis which were composed of the Chippaux-Smirak index, the arch angle, and the arch index. The positive correlation ($p < 0.05$) between radiological measurement and SAI indicated that the increasing talo-horizontal angles had an increasing effect on SAI (Kanatli et al., 2001). These findings revealed that footprint analysis could be used effectively to describe the types of medial longitudinal arch of foot (Kanatli et al., 2006). The value of SAI between 0.44 and 0.89 was defined as normal arch; therefore, the value less than 0.44 and more than 0.89 was defined as high arch and flat arch, respectively (Onodera et al., 2008).

e) Muscle strength testing

Toes deformities are always found in older adults because of the weakness of foot and ankle muscles (Menz et al., 2006). The consequence of toe flexor muscles weakness will reduce the control of body weight shifts during walking, resulting in the slow speed of walking. The effect of slow walking speed increases plantar pressure especially in toe region which affected both foot pain and the risk of falling in older adults (Hill et al., 2008). The muscle strength measurement used manual muscle technique for extrinsic foot muscles and paper grip test for instrinsic foot muscles followed by the study of Keysor et al., (2005) and Menz et al., (2006), respectively. The intrarater reliability were assessed in the pilot study and shown very good agreement of kappa level with the kappa

coefficient of 0.931 for ankle plantarflexors testing, 0.850 for ankle dorsiflexors testing, 1.000 for PGT1, and 0.902 for PGT2 (APPENDIX VIII).

f) Leg length measurement

The previous studies showed the association between foot posture and leg-length discrepancy (Finestone et al., 1991; Korpelainen et al., 2001; Rothbart, 2006; Elbaz et al., 2009). The abnormal foot posture expecially foot pronation had a direct effect on the anterior movement of innominate bones. The consequence of abnormal alignment led to the bone shift of acetabula in upward and backward rotation which was related with knee hyperextension and leg shortening. As a result, the inequality of leg had an association with foot pain due to the abnormal foot posture (Rothbart, 2006). The study of Korpelainen et al., (2001) showed the significant association between the frequency of lower limb fractures and leg-length discrepancy in the athletes group. The limb dominance with a greater use was the main risk factor for lower limb injury (Finestone et al., 1991).

CHAPTER III

RESEARCH METHODOLOGY

3.1. Research design

A cross-sectional study was conducted to determine the association between particular factors and the presence of foot pain during the past month in pre-retirement aged.

3.2. Study area

The study was conducted at Chulalongkorn University, Thailand.

3.3. Study population

The staff of Chulalongkorn University with pre-retirement aged between 50 and 60 years who still have been working were recruited into the study.

3.4. Sampling technique

Cluster sampling technique was used to select the organizations within Chulalongkorn University. Then, the staff within the selected organization who were willing to participate and had age between 50 and 60 years would be recruited for the study. The self-reported questionnaires and physical examination tests for foot region were used in the present study.

3.4.1 Inclusion criteria of the subjects are 1) pre-retirement aged between 50 and 60 years who still have been working 2) staff of Chulalongkorn University 3) working at Chulalongkorn University more than 1 year, and 4) willing to participate in the research.

3.4.2 Exclusion criteria of the subjects are the participants with these conditions at least one item: 1) injury from accident at foot region (i.e. ankle sprain, open wound at foot region) for the last 1 month 2) history of foot fracture 3) history

of operation at foot 4) foot osteoarthritis 5) congenital spine abnormality 6) congenital foot abnormality 7) rheumatoid arthritis 8) cancer 9) gout 10) diabetes mellitus 11) osteoporosis 12) systemic lupus erythematosus (SLE) 13) neurological diseases (i.e. Stroke, Parkinson's disease).

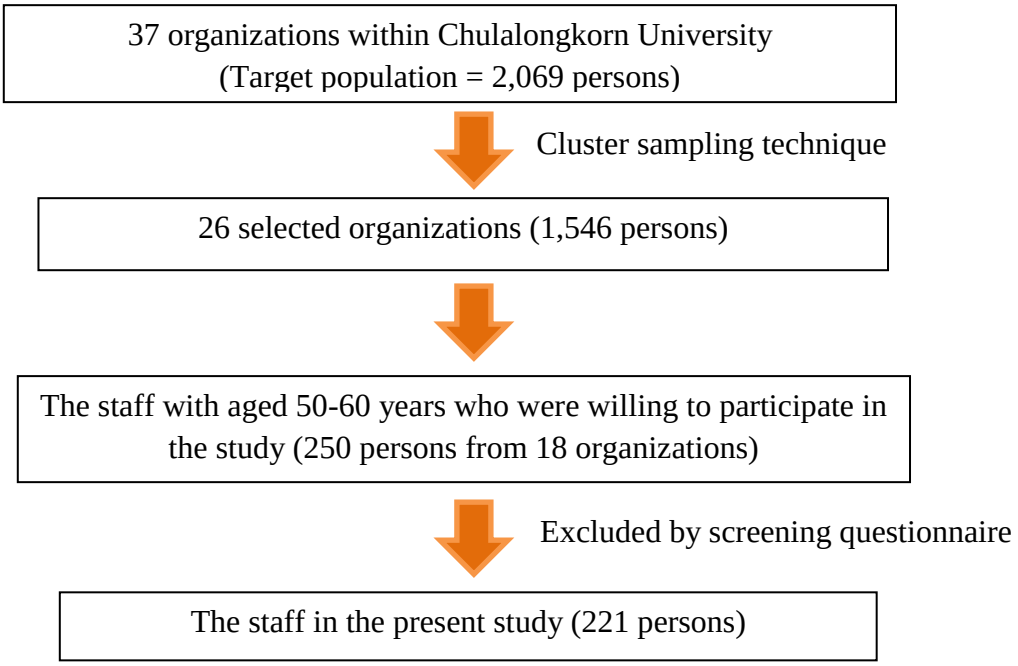


Figure 3: Sampling technique in the present study

3.5. Sample size

The sample sizes in the present study were calculated from the formula of Yamane (1967). When sample size for precision (e) = ±5%, confidence level = 95%, P= 0.5, and the size of population (N) = 2,069, so the sample size (n) = 336.

$$n = \frac{N}{1+N(e)^2}$$

After 10% add-up to cover the missing value, the sample size should be 370 participants.

3.6. Measurement Tools

3.6.1 Subjective Examination

The content of the survey questionnaire in this study was developed based on literature review and a set of standardized questionnaires. A self-reported questionnaire was divided into 6 sections consisting of individuality, work-related physical factors, health behavior, quality of life, history of MSDs during the last 12 months, and foot pain assessment. The individuality, work-related physical factors, and health behavior sections were developed based on literature review. Health-related quality of life was adapted from a 12-item short-form health survey (SF-12) Thai version (Chariyalertsak et al., 2011). The prevalences of MSDs at lower back and lower extremities during the last 12 months were collected by Standardized Nordic questionnaires (Kuorinka, et al., 1987). Also, the prevalence of foot pain during the past month was assessed by the Manchester foot pain and disability index (MFPDI) Thai version (Yamsri and Pensri, 2011).

3.6.2 Physical Examination

The anthropometric variables in the present study were assessed by the physiotherapist including data on body mass index, waist hip ratio, foot problem, types of foot posture, types of foot arch, foot muscles strength, and leg length.

3.6.2.1 Foot problem assessment

Checklist questions (Menz et al., 2001) that were used to report foot problem consisted of the presence of callus formation (the area with hard skin from high pressure), lesser toe deformities (i.e. claw toes, hammer toe, mallet toe), and hallux valgus deformities/bunions (a bony prominence usually defined as lateral deviations of great toe at the metatarsophalangeal joint caused painful and inflammation). The checklist that was adapted from the Manchester scale categorized each deformity into three levels of the severity i.e. mild, moderate, and severe (Garrow et al., 2001).

3.6.2.2 Foot posture index (FPI)

The measurement of foot posture index was described by Redmond et al., (1998). The participants were instructed by the examiner to stand still about 2 minutes in relax position with arms by side and look straight ahead. Then, the examiner assessed the foot posture and reported the scores on left and right sides with six items of figure 3.

Rearfoot Score	**-2**	**-1**	**0**	**1**	**2**
Talar head palpation	Talar head palpable on lateral side/but not on medial side	Talar head palpable on lateral side/slightly palpable on medial side	Talar head equally palpable on lateral and medial side	Talar head slightly palpable on lateral side/ palpable on medial side	Talar head not palpable on lateral side/ but palpable on medial side
Curves above and below the malleoli	Curve below the malleolus either straight or convex	Curve below the malleolus concave, but flatter/ more shallow than the curve above the malleolus	Both infra and supra malleolar curves roughly equal	Curve below malleolus more concave than curve above malleolus	Curve below malleolus markedly more concave than curve above malleolus
Calcaneal inversion/eversion	More than an estimated 5° inverted (varus)	Between vertical and an estimated 5° inverted (varus)	Vertical	Between vertical and an estimated 5° everted (valgus)	More than an estimated 5° everted (valgus)
Forefoot Score	**-2**	**-1**	**0**	**1**	**2**
Talo-navicular congruence	Area of TNJ markedly concave	Area of TNJ slightly, but definitely concave	Area of TNJ flat	Area of TNJ bulging slightly	Area of TNJ bulging markedly
Medial arch height	Arch high and acutely angled towards the posterior end of the medial arch	Arch moderately high and slightly acute posteriorly	Arch height normal and concentrically curved	Arch lowered with some flattening in the central portion	Arch very low with severe flattening in the central portion – arch making ground contact
Forefoot abd/adduction	No lateral toes visible. Medial toes clearly visible	Medial toes clearly more visible than lateral	Medial and lateral toes equally visible	Lateral toes clearly more visible than medial	No medial toes visible. Lateral toes clearly visible

Figure 4: Scoring assessment in each item of Foot posture Index (FPI) (Keenan et al., 2007)

The sum of scores from six items was used to predict the types of foot posture which consisted of normal foot (scores from 0 to +5), pronated foot (scores from +6 to +9), highly pronated foot (score from +10 to +12), supinated foot (score from -1 to -4), and highly supinated foot (score from -5 to -12) (Keenan et al., 2007).

3.6.2.3 Staheli's arch index (SAI)

Staheli's arch index (SAI) was used to describe the types of foot arch from footprint analysis (Staheli et al., 1987). The present study used podograph to perform the static footprint (Kanatli et al., 2001; Urry and Wearing, 2005). As seen in Figure 6, the participants were instructed by the examiner to take a step of non-tested foot on one side of podograph, followed by the placement of tested foot on the inked mat of podograph. Then, the examiner asked the participants to walk off the podograph by the tested foot first, followed by the non-tested foot. As shown in Figure 7, the footprint was used to calculate SAI. It was obtained by calculating the ratio of the width in mid-foot region (A) divided by the width in heel region (B). The value of SAI between 0.44 and 0.89 was defined as normal arch. Therefore, the value less than 0.44 and more than 0.89 were defined as high arch and flat arch, respectively (Onodera et al., 2008).

Figure 5: Static footprint on Podograph

(Kanatli et al., 2001; Urry and Wearing, 2005)

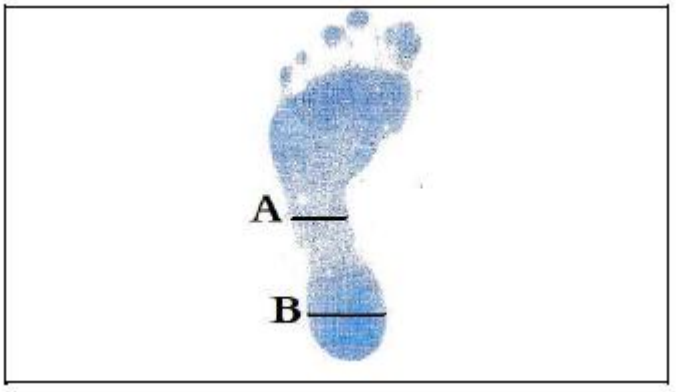


Figure 6: The Satheli's arch index measurement (Staheli et al., 1987)

3.6.2.5 Foot muscles strength testing

The foot muscle strength was measured by paper grip test (PGT1, PGT2) for foot intrinsic muscles and manual muscle testing of ankle dorsiflexors and plantarflexors for foot extrinsic muscles followed by the study of Keysor et al., (2005) and Menz et al., (2006). Considering paper grip test, the participants were instructed by the examiner in sitting position to hold the piece of solid rough paper (2X10 cm, 100 g/m^2 type) against the force of physical therapist under the phalange of great toe (for PGT1) and under the lesser toes (for PGT2) as shown in Figure 7 (de Win et al., 2002). The examiner reported "Pass" level for the normal and "Fail" level for the weakness of foot instrinsic muscles.

Regarding ankle dorsiflexor strength testing, the examiner asked the participants to perform ankle dorsiflexion and hold against the force of examiner at dorsal foot surface in sitting position (Daniels and Worthingham, 2002). There were three levels of foot extrinsic muscle testing i.e. normal, good, and fair levels. The normal level was reported if the participants could hold ankle dorsiflexion through full range of movement; the good level was reported in case of inability to hold through full range

of movement; and the fair level was reported in case of inability to hold ankle dorsiflexion against the force of examiner. The strength of ankle plantarflexor was then measured in standing position. The examiner asked the participants to raise heel on tip toes through full range of flexion with knee straight and then go down to complete one time. The examiner reported fair level for repeating 1-9 times; good level for repeating 10-19 times; and normal level for repeating more than 19 times.

Figure 7: Paper grip test (de Win et al., 2002)

3.6.2.6 Leg length measurement

Leg length was measured in upright standing position with the distance from the tip of the greater trochanter to the floor through the lateral malleolus (Elbaz et al., 2009). The examiner reported “Equal” for the same distance of both sides and “Unequal” for a different distance of both sides. The intrarater reliability were assessed in the pilot study and shown very good agreement of kappa level with the kappa coefficient of 1.000 (APPENDIX H).

3.7. Validity and Reliability test

3.7.1 Validity test

The screening and self-reported questionnaires were reviewed by 3 experts to score each item (+1, 0, -1) in aspect of content validity. The summation of all the scores was then calculated by the formula to assess Index of item-Objective Congruence (IOC) (Rovinelli and Hambleton, 1977). The results from calculation of IOC are 1.00 for the screening questionnaire and 0.79 for the self-reported questionnaire which are higher than 0.5 and reach the acceptable level (APPENDIX H).

3.7.2 Reliability test

To determine the test-retest reliability of the screening and self-reported questionnaire, the questionnaires were pre-tested in 30 subjects between 50 and 60 years of age. All subjects performed the questionnaire for two times, 1-week apart. The reliability of the questionnaires was determined by Kappa coefficient for categorical data and Intraclass correlation coefficient for continuous data (Landis and Koch, 1977; Bowling, 2002). The present study has the coefficients ranged from 0.713 to 1.000 for the screening questionnaire and ranged from 0.611 to 1.000 for the self-reported questionnaire (APPENDIX H).

To determine the intrarater reliability of the physical examination tests which were performed by the physiotherapist on 30 subjects for two times within time-length interval at least 45 minutes. The reliability of each test was determined by Kappa coefficient and Intraclass correlation coefficient. The present study has the coefficient of the physical examination tests ranged from 0.651 to 1.000 (APPENDIX H).

3.8. Research Procedure

The researcher developed self-reported questionnaire and selected appropriate physical examination tests based on literature review. Then, reliability test was performed both of the survey questionnaires and the physical examination tests before data collection.

The cluster sampling technique was firstly used to select 26 organizations within Chulalongkorn University. Then, the covering letters to publicize the research were sent to the selected organizations. A total of 250 participants from 18 organizations agreed to attend the study. The self-report questionnaire and physical examination tests were used to collect data of all 250 participants. Before data analysis process, the screening questionnaire was used to exclude the data of participants. After the screening stage, the remaining subjects were 221 participants in total. The research procedure was shown in Figure 8.

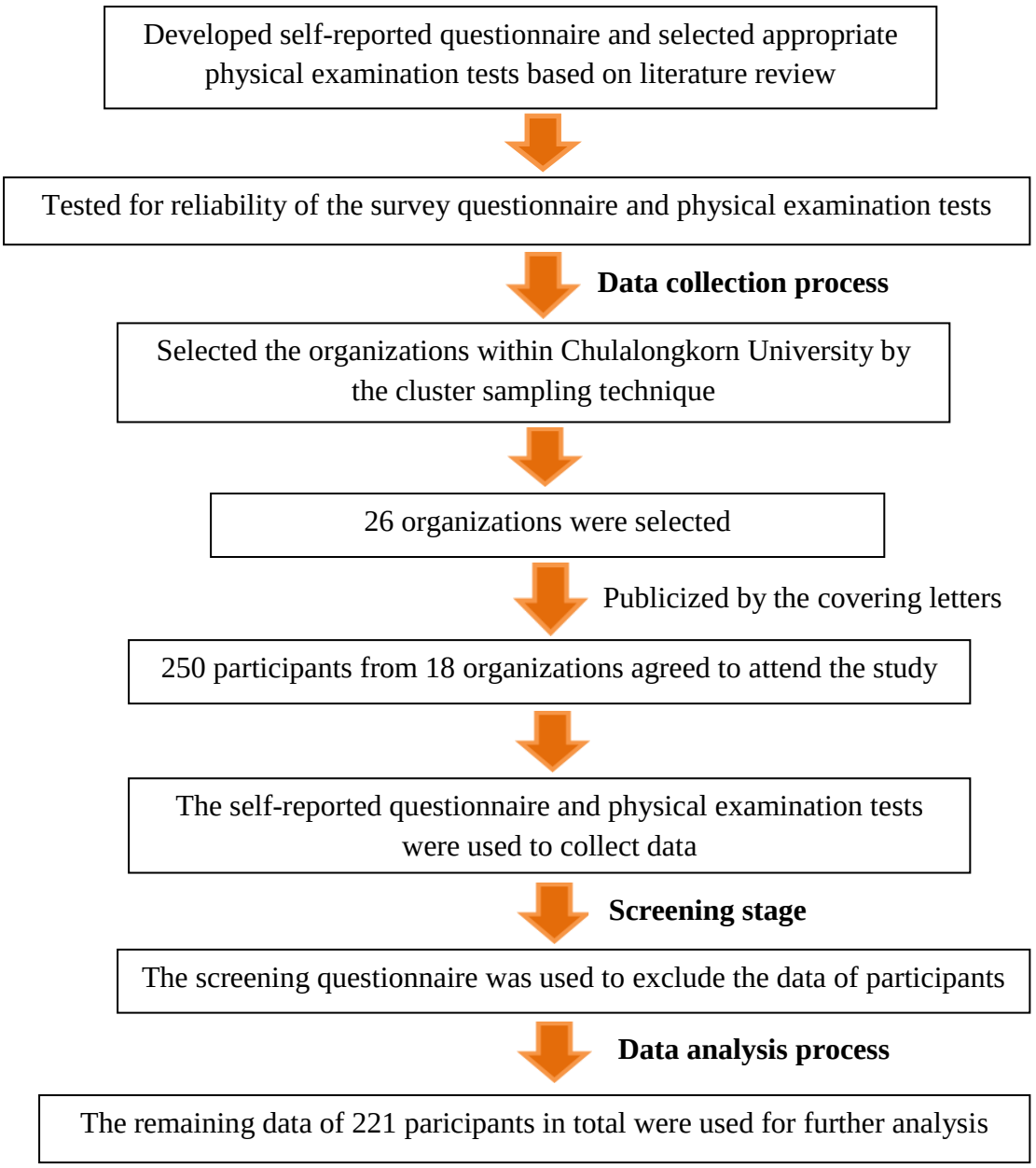


Figure 8: Research Procedure in the present study

3.9. Outcome measurement

3.9.1 Dependent variable

- **The prevalence of foot pain during the past month** was measured using the Manchester foot pain and disability index (MFPDI) Thai version. The participants with foot pain were identified by the persons with current foot pain and pain during the last month for at least 1 score of MFPDI (Garrow et al., 2000).

- **Health-related Quality of life** was measured using the 12-item short-form health survey (SF-12) Thai version. The scores from the SF-12 were calculated into the physical component summary (SF-12 PCS) and the mental component summary (SF-12 MCS). Each component had the scores ranged from 0 to 100; the higher scores indicated better physical and mental functioning (Hoffman and Dukes, 2008).

3.9.2 Independent variable

Independent variables in the study were composed of individual, work-related physical, health behavioral, and anthropometric variables.

- **Individual factors** included age, gender, marital status, education level, low back pain, hip/thigh and knee pain history during the last 12 months, sleeping duration, and falling history during the last 12 months.

- **Work-related physical factors** included job categories, working experience, working duration (hours per week), general working posture, time spent in each working posture per day (i.e. walking, standing, sitting), environmental factors, and rest break after every 2 hours.

- **Health behavioral factors** included leisure physical activity, types of exercise, smoking history, general foot wear, and general foot wear.

- **Anthropometric variables** were assessed by the physiotherapist including data on body mass index, waist hip ratio, foot problem, types of foot posture, types of foot arch, foot muscle strength, and leg length.

3.10. Data Analysis

SPSS software version 17.0 was used for quantitative data analysis.

3.10.1 Descriptive Statistics were used to present each independent variable, prevalence of foot pain, and health-related quality of life in pre-retirement aged. The frequency was shown for the categorical data and mean with standard deviation was shown for the continuous data.

3.10.2 Inferential Statistics were used to explore the associations between the related factors, quality of life and foot pain.

- **Independent t-test** was used to measure the significant differences of SF-12 PCS and SF-12 MCS between the participants with foot pain and without foot pain at significant level $p \leq 0.05$; and also used to compare the related factors (continuous data) between the participants with foot pain and without foot pain.

- **Chi-square analysis** was used to compare the related factors (categorical data) between the participants with foot pain and without foot pain.

- **Multiple logistic regression** was used to measure the significant association between particular factors and the prevalence of foot pain during the past month in pre-retirement aged at significant level $p \leq 0.05$. The factors with p-value less than 0.100 from Independent t-test and Chi-square analysis were used for the multiple logistics regression with backward stepwise method to finalize the adjusted odds ratio (adj. OR) and 95% confidence interval (95% CI). The factors associated with foot pain were reported by adj. OR and 95% CI.

3.11. Ethical Consideration

The study protocol was approved by the Ethical Committee of Chulalongkorn University (through the College of Public Health Sciences) No. 053/2556 on February 26, 2013 (APPENDIX F). The participants gave their permission by completing a consent form prior to the study (APPENDIX G).

CHAPTER IV

RESULT

A cross-sectional study was conducted to determine the association between particular factors and the presence of foot pain during the past month in pre-retirement aged personnel of Chulalongkorn University. Data analysis began with descriptive statistic for demographic data and inferential statistic for the comparison of each factor between the participants with foot pain and without foot pain. Data collection was done during Febuary and March 2013. A total of 250 participants from 18 organizations agreed to attend the study. Using a screening questionnaire, 29 participants were excluded. Therefore, the remaining subjects were 221 participants in total. The characteristics of participants are shown in Table 1.

4.1. Demographic data of participants

As seen in Table 1, almost all of the participants were female (84.6%) with the average age of 53.2 ± 4.3 (mean ± standard deviation). The mean of body mass index was 24.8 ± 4.3 kg/m^2 which were grouped into the normal weight group (the cut-off value for overweight group = 25.0 kg/m^2) (WHO, 2004). The mean of waist hip ratio was 0.87 ± 0.1 which were grouped into the abdominal obesity group and related with cardiovascular disease (the cut-off value for abdominal obesity = 0.85 for female and 0.90 for male) (WHO, 2008). However, almost all of the participants were healthy group (86.4%). 43.3% of the participants with medical conditions were hypertension and 33.3% were hyperlipemia. Considering in education level, the most participants graduated higher bachelor degree (41.8%). Almost all of the participants were supporting staff (73.3%) with the mean working experience of 305.9 ± 88.6 months or more than 20 years and the mean working duration of 47.2 ± 9.8 hours per week. A hundred five participants (47.5%) were defined as foot pain group in this study.

Table 1 Characteristics of Chulalongkorn University personnel (n=221)

Characteristics	**n**	**%**	**Mean**	**SD**
Gender				
- Male	34	15.4		
- Female	187	84.6		
Age (Years)			53.2	4.3
Body mass index (kg/m2) (min-max: 17.1-42.5)			24.8	4.3
- Male (min-max: 19.0-33.7)			25.1	3.8
- Female (min-max: 17.1-42.5)			24.7	4.4
Waist hip ratio (min:max: 0.70-1.04)			0.87	0.1
- Male (min-max: 0.81-1.04)			0.91	0.1
- Female (min-max: 0.70-1.02)			0.86	0.1
Education Level				
- Lower than Bacheolar degree	42	19.1		
- Bacheolar degree	86	39.1		
- Higher than bacheolar degree	92	41.8		
Job categories				
- Academic Staff	59	26.7		
- Supporting Staff	162	73.3		
Working Experience (months) (min-max: 20-420)			305.9	88.6
Working duration (hours per week) (min-max: 26-84)			47.2	9.8
Participants with medical history	30	13.6		
Participants with foot pain	105	47.5		
- Male	17	50.0		
- Female	88	47.1		

4.2. The comparison in health-related quality of life between two groups

Data on 217 participants were used to analyze the differences between participants with foot pain and participants without foot pain in two dimensions of health-related quality of life which were composed of physical component summary (SF-12 PCS) and mental component summary (SF-12 MCS). 4 participants were excluded from the analysis because of some uncompleted data. As seen in Table 2, the mean of SF-12 PCS ± SD was 44.5 ± 7.9 for the total participants, 42.5 ± 7.9 for the participants with foot pain, and 46.3 ± 7.5 for the participants without foot pain. The mean of SF-12 MCS ± SD was 48.4 ± 7.3 for the total participants, 46.6 ± 7.8 for the participants with foot pain, and 49.9 ± 6.4 for the participants without foot pain. There were significant differences of SF-12 PCS ($p < 0.001$) and SF-12 MCS ($p = 0.001$) between participants with foot pain and without foot pain using Independent t-test at significant level $p \leq 0.05$.

Table 1 Health-related quality of life of Chulalongkorn personnel (n=217)

SF-12	**Mean (SD)**		**Total**
	With foot pain (n=105)	**Without foot pain (n=112)**	**(n=217)**
Health-related quality of life			
SF-12 PCS	42.5 (7.9)*	46.3 (7.5)*	44.5 (7.9)
SF-12 MCS	46.6 (7.8)**	49.9 (6.4)**	48.4 (7.3)

* p-value < 0.001 using Independent t-test at significant level $p \leq 0.05$

** p-value = 0.001 using Independent t-test at significant level $p \leq 0.05$

4.3. The association between particular factors and foot pain

The prevalence of foot pain during the past month was 47.5% from Table 1. Then, univariate analysis was used to compare the related factors between the participants with foot pain (n=105) and the participants without foot pain (n=116). The comparisons of related factors between groups are presented in Table 3 for categorical data and Table 4 for continuous data.

According to the Table 3, the participants with foot pain were found higher in male (50.0%) than female (47.1%). The married participants reported their foot pain (50.8%) more than divorced (45.5%) and single (42.3%) participants, respectively. By education level, the participants with foot pain had higher percentage in lower bachelor degree (50.0%) than bachelor degree (48.8%) and higher bachelor degree (44.6%), respectively. The participants with foot pain were more likely to reported low back pain history (58.2%), hip/thigh pain history (59.5%), knee pain history (62.6%), and falling history (63.0%) than the participants without foot pain.

Regarding work-related physical factors, the supporting staff reported their foot pain (49.4%) more than academic staff (42.4%). The participants with foot pain were more likely to have working posture in prolong standing (56.4%), walking for long distance (50.5%), and lifting (60.0%) than the participants without foot pain. By working environment, the participants without foot pain reported appropriate working environment regarding without noise disturbing (54.9%), appropriate temperature (50.6%), enough lighting (52.9%), and good air ventilation (53.7%) more than the participants without foot pain. The rest break in every 2 hours was also found higher in the participants without foot pain (51.1%) than the participants with foot pain (48.9%).

In addition, the participants without foot pain had physical activity in both of weight bearing exercise (54.0%) and non weight bearing exercise (53.8%) more than the participants with foot pain. Smoking history was found in the foot pain group (70.0%) more than the non foot pain group (30.0%). The participants with foot pain were more likely to concern about their foot care of general self-foot assessment (51.6%), foot soaking (55.0%), nail cut straight (50.7%), and foot

massage (55.8%) than the participants without foot pain. However, the result showed opposite way in the shoewear decision; the participants without foot pain were inclined to use the suitable footwear regarding appropriate foot size (52.5%), soft insole (55.3%), heel counter softness (57.9), adjustable fixation (53.8%), sole flexion point (50.9%), and heel height within 2.5 cm (55.5%) more than the participants without foot pain.

Considering foot problem assessment, the participants with foot pain were more likely to have callus formation at hindfoot/heel (72.7%) and lesser toes deformities (70%) than the participants without foot pain. However, the foot pain group had less callus formation at big toe (38.9%), 2^{nd}-5^{th} toes (43.2%), fore foot (47.3%), and hallux valgus deformity (62.1%) than the non foot pain group. By the foot types, the partcipants with foot pain had pronated foot type (57.8%), supinated foot type (58.6%), and flat arch (66.7%) more than the participants without foot pain. The normal strength of ankle plantarflexors, ankle dorsiflexors, and the equal leg length were found more in the non foot pain group (63.6%; 59.2%; and 52.8%, respectively) than the foot pain group, while the normal strength of foot instrinsic muscles were found more in the foot pain group (50.8%) than the non foot pain group.

As shown in Table 3, the analysis using chi-square test found 14 factors showing p-value < 0.100. The factors were composed of history of low back pain ($p < 0.001$), history of hip/thigh pain ($p = 0.005$), history of knee pain ($p < 0.001$), falling history ($p = 0.019$), prolong standing of more than 2 hours ($p = 0.091$), lifting of more than 5 kg ($p = 0.025$), callus formation at hindfoot/heel ($p = 0.013$), the presence of hallux valgus ($p = 0.042$), the presence of lesser toe deformities ($p = 0.035$), normal foot type ($p = 0.007$), pronated foot type ($p = 0.050$), flat arch ($p = 0.047$), ankle plantarflexor muscles strength ($p = 0.034$), and ankle dorsiflexor muscles strength ($p = 0.008$).

Table 2 The comparison of related factors (categorical data) between participants with foot pain and participants without foot pain using Chi-square test (n=221)

Related factors	n (%)		p-value
	With foot pain (n=105)	Without foot pain (n=116)	
Individual factors			
Gender			0.752
- Male	17 (50.0)	17 (50.0)	
- Female	88 (47.1)	99 (52.9)	
Marital status			0.503
- Single	30 (42.3)	41 (57.7)	
- Married	65 (50.8)	63 (49.2)	
- Divorced	10 (45.5)	12 (54.5)	
Education level			0.786
- Lower bachelor degree	21 (50.0)	21 (50.0)	
- Bachelor degree	42 (48.8)	44 (51.2)	
- Higher bachelor degree	41 (44.6)	51 (55.4)	
History of MSDs at these areas:			
- Low back pain	71 (58.2)	51 (41.8)	**<0.001***
- Hip/Thigh pain	44 (59.5)	30 (40.5)	**0.005***
- Knee pain	77 (62.6)	46 (37.4)	**<0.001***
Falling history	29 (63.0)	17 (37.0)	**0.019***
Work-related physical factors			
Job categories			0.356
- Academic Staff	25 (42.4)	34 (57.6)	
- Supporting Staff	80 (49.4)	82 (50.6)	
Prolong sitting more than 2 hours	80 (46.8)	91 (53.2)	0.998
Prolong standing more than 2 hours	31 (56.4)	24 (43.6)	**0.091***
Walking more than 2 km /day	47 (50.5)	46 (49.5)	0.277

Table 3 continued…….

Lifting more than 5 kg	33 (60.0)	22 (40.0)	**0.025***
Stair climbing at least 20 steps	68 (46.6)	78 (53.4)	0.989
Working environment:			
Without noise disturbing	65 (45.1)	79 (54.9)	0.335
Appropriate temperature	88 (49.4)	90 (50.6)	0.229
Enough lighting	98 (47.1)	110 (52.9)	0.631
Good air ventilation	69 (46.3)	80 (53.7)	0.610
Rest break in every 2 hours	87 (48.9)	91 (51.1)	0.565
Health behavior factors			
Leisure physical activity	55 (46.6)	63 (53.4)	0.832
Types of exercise			0.989
- Weight bearing	46 (46.0)	54 (54.0)	
- Non weight bearing	12 (46.2)	14 (53.8)	
History of smoking	11 (70.0)	5 (30.0)	0.256
General foot care:			
General self-foot assessment	33 (51.6)	31 (48.4)	0.414
Foot skin moisture	40 (41.7)	45 (52.9)	0.960
Foot soaking	11 (55.0)	9 (45.0)	0.454
Nail cut straight	74 (50.7)	72 (49.3)	0.217
Foot massage	24 (55.8)	19 (44.2)	0.223
Foot stocking	22 (38.6)	35 (61.4)	0.118
Foot exercise	22 (50.0)	22 (50.0)	0.709
General shoewear:			
Appropriate foot size	96 (47.5)	106 (52.5)	0.550
Soft insole	72 (44.7)	89 (55.3)	0.254
Heel counter softness	51 (42.1)	70 (57.9)	0.170
Adjustable fixation	30 (46.2)	35 (53.8)	0.866
Sole flexion point	57 (49.1)	59 (50.9)	0.459

Table 3 continued…….

Heel height			0.457
- 0-2.5 cm	57 (44.5)	71 (55.5)	
- 2.6-5.0 cm	37 (48.1)	40 (51.9)	
- More than 5.0 cm	7 (63.6)	4 (36.4)	
Physical examination			
Callus formation at these areas:			
Big toe	21 (38.9)	33 (61.1)	0.144
2^{nd} – 5^{th} toes	19 (43.2)	25 (56.8)	0.520
Fore foot	53 (47.3)	59 (52.7)	0.954
Hind foot/Heel	16 (72.7)	6 (27.3)	**0.013***
Degree of hallux valgus			**0.042***
- None	69 (54.8)	57 (45.2)	
- Mild	21 (36.2)	37 (63.8)	
- Moderate and severe	15 (40.5)	22 (59.5)	
Presence of lesser toes	14 (70.0)	6 (30.0)	**0.035***
deformities			
Foot posture index:			
Normal type	51 (39.8)	77 (60.2)	**0.007***
Pronated type	37 (57.8)	27 (42.2)	**0.050***
Supinated type	17 (58.6)	12 (41.4)	0.199
Staheli's arch index:			
Normal arch	71 (44.9)	87 (55.1)	0.225
Flat arch (Pes planus)	16 (66.7)	8 (33.3)	**0.047***
High arch (Pes cavus)	18 (46.2)	21 (53.8)	0.852
Muscle strength testing:			
PGT1			0.298
- Pass	96 (48.7)	101 (51.3)	
- Fail	9 (37.5)	15 (62.5)	

Table 3 continued……

PGT2			0.281
- Pass	61 (50.8)	59 (49.2)	
- Fail	44 (43.6)	57 (56.4)	
Ankle plantarflexors			**0.034***
- Fair	18 (66.7)	9 (33.3)	
- Good	67 (48.2)	72 (51.8)	
- Normal	20 (36.4)	35 (63.6)	
Ankle dorsiflexors			**0.008***
- Good	47 (59.5)	32 (40.5)	
- Normal	58 (40.8)	84 (59.2)	
Leg length measurement			0.778
- Equal	91 (47.2)	102 (52.8)	
- Unequal	14 (50.0)	14 (50.0)	

* p-value < 0.100 using Chi-square test

According to the Table 4, the participants without foot pain had the average of sleeping duration (6.2 ± 1.0), working experience in months (310.6 ± 87.4), and working duration (50.9 ± 9.2) more than the participants with foot pain. While the participants with foot pain were more likely to spent time in sitting posture (299.4 ± 119.4) and standing posture (105.4 ± 67.9) than the participants without foot pain. Considering the obesity index, the foot pain group had the average of body mass index (25.4 ± 4.2) and waist hip ratio (0.874 ± 0.1) more than the non foot pain group.

As shown in Table 4, the analysis using independent t-test found only one factor showing p-value < 0.100 i.e. body mass index (p = 0.054).

Table 3 The comparison of related factors (continuous data) between participants with foot pain and participants without foot pain using Independent t-test (n=221)

Related factors	Mean (SD)		p-value
	With foot pain (n=105)	Without foot pain (n=116)	
Individual factors			
Sleeping duration (hours per day)	6.0 (1.1)	6.2 (1.0)	0.228
Work-related physical factors			
Working experience (months)	300.9 (90.0)	310.6 (87.4)	0.416
Time working per week (hours)	43.1 (7.7)	50.9 (9.2)	0.373
Time spent in these posture:			
Walking	115.9 (69.0)	115.9 (92.6)	0.997
Sitting	299.4 (119.4)	286.9 (119.0)	0.468
Standing	105.4 (67.9)	96.0 (73.3)	0.372
Physical examination			
Body mass index (kg/m2)	25.4 (4.2)	24.2 (4.3)	**0.054***
Waist per hip ratio	0.874 (0.1)	0.865 (0.1)	0.415

* p-value < 0.100 using Independent t-test

4.4. Factors associated with foot pain in pre-retirement aged

The factors with p-value < 0.100 from Table 3 and Table 4 were used for further analysis. The odds ratios of each factor with significant association were unadjusted odds ratio (crude OR); they might be related with each others. Therefore, the multiple logistics regression with backward stepwise method was used to finalize the model with adjusted odds ratio (adj. OR) and 95% confidence interval (95% CI). The last step of backward stepwise regression analysis as demonstrated in Table 5 showed the factors related with foot pain at significant level p-value ≤ 0.05 which were composed of low back pain history (p = 0.034), knee pain history (p = 0.001), prolong standing (p = 0.050), mild hallux valgus (p = 0.010), and fair ankle plantarflexors strength (p = 0.026).

According to the Table 5, the personnel with history of low back pain and knee pain were more likely to have foot pain (adj. OR = 2.04, 95% CI = 1.06-3.95; and adj. OR = 3.24, 95% CI = 1.67-6.31, respectively). Also, the prolong standing posture showed the elevated risk for foot pain (adj. OR = 2.12, 95% CI = 1.00-4.49). The physical examination found the significant associations of mild hallux valgus and fair ankle plantarflexors strength with foot pain (adj. OR = 0.37, 95% CI = 0.17-0.79; and adj. OR = 3.60, 95% CI = 1.17-11.10, respectively). Considering the pronated foot type, the result showed almost significant association with foot pain (adj. OR = 1.97, 95% CI = 1.00-3.92).

Table 4 The odds ratio (OR) and 95% confidence interval (CI) of factors associated with foot pain in the final model using Backward stepwise regression analysis

Related factors	Bivariate analysis		Multivariate analysis	
	Crude OR (95% CI)	**p-value**	**Adj. OR (95% CI)**	**p-value**
History of low back pain				
- No	1.00		1.00	
- Yes	3.02 (1.72-5.30)	**<0.001****	2.04 (1.06-3.95)	**0.034****
History of knee pain				
- No	1.00		1.00	
- Yes	4.28 (2.41-7.61)	**<0.001****	3.24 (1.67-6.31)	**0.001****
Falling history				
- No	1.00		1.00	
- Yes	2.20 (1.13-4.30)	**0.021****	2.04 (0.93-4.49)	0.077
Prolong standing				
- No	1.00		1.00	
- Yes	1.70 (0.92-3.15)	0.093	2.12 (0.998-4.49)	**0.050****
Hallux valgus				
- None	1.00		1.00	
- Mild	0.47 (0.25-0.89)	**0.020****	0.37 (0.17-0.79)	**0.010****
- Moderate	0.47 (0.21-1.04)	0.063	0.58 (0.23-1.47)	0.252
- Severe	2.48 (0.25-2.45)	0.437	0.97 (0.09-10.6)	0.979
Pronated foot type				
- No	1.00		1.00	
- Yes	1.79 (0.996-3.23)	**0.051**	1.97 (0.994-3.92)	**0.052**
Ankle plantarflexors strength				
- Normal	1.00		1.00	
- Good	1.63 (0.86-3.10)	0.137	1.84 (0.84-4.04)	0.130
- Fair	3.50 (1.33-9.24)	**0.011****	3.60 (1.17-11.1)	**0.026****

** Significant level at p-value ≤ 0.05

CHAPTER V

DISCUSSION

5.1. Prevalence of foot pain during the past month in pre-retirement aged

The first aim of the study was to determine the prevalence of foot pain during the past month in pre-retirement aged of Chulalongkorn University personnel. The result showed high prevalence of foot pain (47.5%) when compared with other studies. Garrow et al., (2004) reported the prevalence of foot pain approximately 10% in the population survey. In addition, the highest prevalence of foot pain was found at aged 55-64 years (15%). Similarly, the study of Hill et al., (2008) found the prevalence of foot pain approximately 17.4% in a population-based study with the highest rate at aged more than 55 years. The previous study showed the highest prevalence of foot pain among the group with aged more than 50 years. Therefore, the present study recruited only older adult group with aged more than 50 years.

The findings indicate higher prevalence of foot pain. The plausible explanation is due to the inclusion criteria of our study which focused on the working population with the shorten range of age 50-60. The participants were voluntary; therefore, the persons with foot pain had inclination to attend the study in the higher proportion than the samples in previous studies. Considering work-related factors, the previous studies showed high prevalence of foot pain among working population if compared with the studies among general population. For example, the study of Pensri et al., (2009) found the prevalence of foot pain with 35% among salespersons workers. Messing et al., (2008) reported the higher prevalence of foot pain (51%) among assembly plant workers. In addition, working duration more than 40 hours per week and working experience more than 20 years were also the risk factors to increase the prevalence of foot pain same as our findings. Obviously, the mean of body mass index and waist hip ratio ± SD were almost reached the higher level (24.8 ± 4.3 and 0.87 ± 0.1, respectively) when compared with the cut-off point for overweight of 25.0-29.9, abdominal obesity of

0.85 for female, and 0.90 for male. These finding were supported with the study of Hill et al., (2008) that the high prevalence of foot pain was associated with high body mass index and high waist hip ratio. The association between obesity and foot pain can be explained by the increasing forces under the foot during walking. As a result, the obese group is more likely to have chronic heel pain and flat foot than the normal group (Birtane and Tuna, 2004; Irving et al., 2007).

In general, female have high prevalence of foot pain more than male. The previous studies revealed that the poor shoewear style i.e. heel height more than 2.5 cm affected high plantar pressure which induced foot pain and the risk of falling in older women (Tencer et al., 2004; Mickle et al., 2010). Interestingly, the present study showed high prevalence of foot pain in male (50.0%) more than female (47.1%). The plausible explanation may be due to the obesity and the small sample size in male group. The result showed that the mean of body mass index ± SD in male were group into the overweight group (25.1 ± 3.8) and the mean of waist hip ratio ± SD were group into the abdominal obesity group (0.91± 0.1).

5.2. The comparison in health-related quality of life between two groups

The present study found the SF-12 PCS and SF-12 MCS lower than 50 scores among pre-retirement aged group of Chulalongkorn University personnel. The average score of each component among general population is approximately 50 (Wilson et al., 2002). The positive significant differences between participants with foot pain and without foot pain were found in the present study. Similarly to the result from the previous studies, for example, Hill et al., (2008) found that the impact of foot pain decreased overall health-related quality of life. The study of Menz et al., (2006) also found the association between foot pain and the reduction of scores in physical component summary and mental component summary of SF-36. The plausible explanation is that the condition of foot pain restricted the activity of daily life i.e. the limitation of walking long distance, standing, avoiding hard or rough surfaces. As a result, the presence of foot pain reduces not only functional

capacity but also the overall quality of life including mental health status, social function, and vitality (Mickle et al., 2010).

5.3. Factors associated with foot pain in pre-retirement aged

The final modeling of backward stepwise logistics regression showed the factors associated with foot pain using the last step of analysis. The significant factors were composed of history of low back pain, history of knee pain, prolong standing, the presence of hallux valgus, reduced ankle plantarflexors strength, and pronated foot type. The adjusted odds ratios and 95% confidence interval were used to explain the factors related with foot pain because the model had already control confounding factors.

5.3.1 History of low back pain

The significant association between history of low back pain and foot pain was found in the present study with the adjusted OR of 2.04 (95% CI = 1.06-3.95). The previous studies also supported our result. For example, Hill et al., (2008) found the association between foot pain and low back pain with adjusted OR of 2.36 (95% CI = 1.94-2.86). Similarly to the study of Garrow et al., (2004), they found the association between disabling foot pain and axial skeleton pain with adjusted OR of 3.40 (95% CI = 2.7-4.3). The mechanism of low back pain might be connected with distal disturbances of lower extremities in the locomotor system (Rothbart et al., 1988). In addition, the foot problem altered the normal gait and normal alignment resulting in the loss of shock absorption which stimulated the emergence of locomotor conditions i.e. low back pain. The previous studies found that the limitation of ankle dorsiflexion movement during weight-bearing posture was related with chronic mechanical low back pain (Brantingham et al., 2006). However, we could not find the causal relationship from this cross-sectional study; the finding can be used to explain only the association between foot pain and low back pain which may be benefit for further studies about the treatment at foot region

i.e. custom-made shoe orthotics to decrease musculoskeletal disorders at lower back and lower extremities.

5.3.2 History of knee pain

The significant association between history of knee pain and foot pain was found in the analysis model with adjusted OR of 3.24 (95% CI = 1.67-6.31). Similarly to the study of Hill et al., (2008), they found the significant association between knee pain and foot pain with adjusted OR of 2.40 (95% CI = 1.92-3.01). Likewise the study of Garrow et al., (2004), they found the significant association with adjusted OR of 3.10 (95% CI = 2.4-4.0). The excessive loading of the knee can increase the compressive stress of patellofemoral or tibiofemeoral joint led to the mechanical stress of ankle joint during ground contact. During the weight-bearing activities, the posture and motion of the knee and foot are coupled within the closed kinematics chain (Gross et al., 2011). The excessive rotation of the lower limb at the articulation of knee joint and ankle joint cause knee and ankle/foot pain from overuse injury that may lead to the osteoarthritis of both foot and knee region in the long term effect (McDaniel et al., 2011).

5.3.3 Prolong standing

The presence of foot pain related with occupational factors. Our results showed significant association between foot pain and prolong standing more than 2 hours with adjusted OR of 2.12 (95% CI = 0.998-4.49). Pensri et al., (2010) also found the significant association between foot pain and static standing posture among salesperson workers. Similarly to the study of Messing et al., (2008), they found that fixed standing posture had higher risk for foot pain with adjusted OR of 3.95 (95% CI = 2.56-6.10). Prolong standing for more than 2 hours increased the risk of blood circulation restriction leading to the swelling at calf muscle and lower extremities injury (Madeleine et al., 1988). In addition, the study of Lin et al., (2012) among prolong standing workers found that the static posture without ankles and hips movement caused the swelling of leg muscles. The high risk factor of foot pain also increased as a result of the joint compression at lower limb for long time in

static standing posture. In sum, the workers should move ankles and hips for the short time period during static standing for 30 minutes to decrease lower leg muscles discomfort (Lin et al., 2012).

5.3.4 The presence of hallux valgus (HV)

The result showed negative significant association between the prevalence of mild hallux valgus and foot pain with the adjusted OR of 0.37 (95% CI = 0.17-0.79). Similarly to the study of Nguyen et al., (2009), they found negative association between HV and foot pain among men. In general, HV is positively related with foot pain (Menz et al., 2005; Nix et al., 2012). It is the risk factor to develop foot pain since the progressive foot deformity from lateral deviation of the hallux increased subluxation of the first metatarsophalangeal joint leading to the presence of osteoarthritis and foot pain (D'Arcangelo et al., 2010). In contrast, our result showed a negative association i.e. participants who had hallux valgus were more likely to not suffer from foot pain. The current result was similar to that of Nguyen's study. The previous study could not explain any reasons for the negative association (Nguyen et al., 2009). However, the possible explanation for the present study may be related to the data that the participants without foot pain tended to choose more appropriate shoewear. As recognizably, appropriate shoewear can reduce the risk of foot pain. Those participants with hallux valgus might previously had the experience of foot pain and thus chose more appropriate shoewear to reduce their foot pain. The study of Nix et al., (2012) revealed that participants with HV had significant concerns about footwear and foot appearance more than the participants without HV. This notion might explain the reduction of risk factor for foot pain in HV group.

5.3.5 Reduced ankle plantarflexors strength

The findings showed significant association between foot pain and fair degree of ankle plantarflexors strength with adjusted OR of 3.60 (95% CI = 1.17-11.1). The results of previous studies supported that a decrease in muscle strength led to the risk factor of foot pain. (Mickle et al., 2010). To our knowledge, the fair

degree of ankle plantarflexors strength is not enough to maintain body weight during walking because the push off phase in gait cycle needs higher strength i.e. the good and normal degree to resist the gravity to raise the heel. The reduction of muscle strength would increase fatigue level to maintain body weight during weight-bearing activities, leading to the foot pain related to overuse injury (Ciubotariu et al., 2007).

Considering the result from table 4.5, the result showed almost significant association (p = 0.052) between foot pain and pronated foot type with adjusted OR of 1.97 (95% CI = 0.994-3.92). Even take into the consideration, the plausible explanation is that the normal pronation of subtalar joint occurs after heel strike with the normal range between 4º and 8º in each gait cycle. The abnormal pronated foot can affect the compression force acting on subtalar joint, and generate the abnormal tibial rotation, causing overuse injury on the lower extremities (Hetsroni et al., 2006). In addition, excessive foot pronation when normally it should be supination would result in the development of slight discomfort and foot pain or postural symptom (Sgarlato, 1971). The study of Reinking et al., (2012) found the higher percentage of exercise-related leg pain in the athletes with pronated group than the athletes with supinated and neutral foot type. Evidence from some clinical trials showed that the correction of excessive pronated foot posture by foot orthotics might reduce the knee and foot pain intensity (Shih et al., 2011).

5.4. Strength/Limitation of this study and suggestion for further study

This is the first study to determine the factors associated with foot pain among pre-retirement aged group. The major strength of the present study is that the measurement tools using for the study included not only self-reported questionnaire but also physical examination by physical therapist. The factors related with foot pain generalize the individual factor, work-related physical factor, health behavioral factor, anthropometric factor and also the consequence of foot pain related with psychological factor. The information regarding to the association with foot pain is

useful for further studies about the prevention and treatment of foot pain. The pilot study showed high reliability of measurement tools both the questionnaire and the physical examination test. However, the weak points of our study were found in some measurement tools such as manual muscle strength testing both of the extrinsic and instrinsic muscles. The next study should use hand-held dynamometer to test the muscle strength in kilogram unit. The limitations of the present study were also found in several points. First, the cross-sectional design could not determine the causal relationship or the risk factors of foot pain. The current result can present only the association among particular factors and foot pain. And due to the limitation of time, we could not reach the target number of sample size because the activity for one participant took time for almost 1 hour. The consequence of small sample size may reduce the statistics power. Further studies should use the prospective design to determine the risk factor of foot pain. Second, the recall bias of self-reported questionnaire may be found in the present study. Therefore, the observation or interview method should be used in the future study to decrease wrong recall and wrong understanding of each question. Third, the diagnosis of foot pain was subjective, thus it may lead to the weakness of data. The objective information should be included in the dependent variable to increase more strength of the data and pain scale measurement should be added in the examination. Last, the participants have the main general working posture of prolong sitting that might not be directly related with foot pain. The future study should emphasize on the workers with prolong standing posture which may be more directly related to the risk of foot pain.

5.5. Conclusion

Foot pain is one of the musculoskeletal problems commonly found among older workers. 47.5% of this sample of pre-retirement aged personnel at Chulalongkorn University reported MSDs during the past month at foot region. The factors significantly associated with foot pain consist of the history of MSDs at lower back region and knee region, pronated foot type, the presence of hallux

valgus, and the ankle plantarflexors strength. In addition, occupational factors are also associated with foot pain especially in general working posture with prolong standing for more than 2 hours. The consequence of foot pain decreases the overall quality of life in the term of both physical and mental components. The findings about factors associated with foot pain provide useful information for the development of the prevention strategies for musculoskeletal foot pain in this age group. Future studies to determine the cause-effect relationship between foot pain and those important factors are required.

REFERENCES

Andersen, J. H., Haahr, J. P., & Frost, P. (2007). Risk factors for more severe regional musculoskeletal symptoms: a two-year prospective study of a general working population. *Arthritis Rheum,* 56(4): 1355-1364.

Badlissi, F., Dunn, J. E., Link, C. L., Keysor, J. J., McKinlay, J. B., & Felson, D. T. (2005). Foot musculoskeletal disorders, pain, and foot-related functional limitation in older persons. *J Am Geriatr Soc,* 53(6): 1029-1033.

Benvenuti, F., Ferrucci, L., Guralnik, J. M., Gangemi, S., & Baroni, A. (1995). Foot pain and disability in older persons: an epidemiologic survey. *J Am Geriatr Soc,* 43(5): 479-484.

Birtane, M., & Tuna, H. (2004). The evaluation of plantar pressure distribution in obese and non-obese adults. *Clin Biomech (Bristol, Avon),* 19(10): 1055-1059.

Bland, J. M., & Altman, D. G. (1996). Measurement error. *BMJ,* 312(7047): 1654.

Bowling, A. (2002). *Research methods in health: investigating health and health services (2nd edition).* Buckingham; Philadelphia: Open University Press.

Brantingham, J. W., Lee Gilbert, J., Shaik, J., & Globe, G. (2006). Sagittal plane blockage of the foot, ankle and hallux and foot alignment-prevalence and association with low back pain. *J Chiropr Med,* 5(4): 123-127.

Buranatrevedh, S., & Sweatsriskul, P. (2005). Model development for health promotion and control of agricultural occupational health hazards and accidents in Pathumthani, Thailand. *Ind Health,* 43(4): 669-676.

Butler, R. J., Hillstrom, H., Song, J., Richards, C. J., & Davis, I. S. (2008). Arch height index measurement system: establishment of reliability and normative values. *J Am Podiatr Med Assoc,* 98(2): 102-106.

Chaiwanichsiri, D., Janchai, S., & Tantisiriwat, N. (2009). Foot disorders and falls in older persons. *Gerontology,* 55(3): 296-302.

Chariyalertsak, S., Wansom, T., Kawichai, S., Ruangyuttikarna, C., Kemerer, V. F., & Wu, A. W. (2011). Reliability and validity of Thai versions of the MOS-HIV and SF-12 quality of life questionnaires in people living with HIV/AIDS. *Health Qual Life Outcomes* 9: 15.

Chavalitsakulchai, P., & Shahnavaz, H. (1993). Musculoskeletal disorders of female workers and ergonomics problems in five different industries of a developing country. *J Hum Ergol (Tokyo),* 22(1): 29-43.

Chowanadisai, S., Kukiattrakoon, B., Yapong, B., Kedjarune, U., & Leggat, P. A. (2000). Occupational health problems of dentists in southern Thailand. *Int Dent J,* 50(1): 36-40.

Chuenchoksan S and Nakornthab D (2008). *Past, present, and prospects for Thailand's growth: a labor market perspective.* Report of Bank of Thailand: Bangkok.

Ciubotariu, A., Arendt-Nielsen, L., & Graven-Nielsen, T. (2007). Localized muscle pain causes prolonged recovery after fatiguing isometric contractions. *Exp Brain Res,* 181(1): 147-158.

Crosbie, J., & Burns, J. (2008). Are in-shoe pressure characteristics in symptomatic idiopathic pes cavus related to the location of foot pain? *Gait Posture,* 27(1): 16-22.

D'Arcangelo, P. R., Landorf, K. B., Munteanu, S. E., Zammit, G. V., & Menz, H. B. (2010). Radiographic correlates of hallux valgus severity in older people. *J Foot Ankle Res* 3: 20.

Dababneh, A. J., N. Swanson, et al. (2001). Impact of added rest breaks on the productivity and well being of workers. *Ergonomics* 44(2): 164-174.

Daniels, K., & Worthingham, C. (2002). *Muscle testing: Techniques of manual examination (5th edition).* Philadelphia: WB Sauders.

Dawson, J., Thorogood, M., Marks, S. A., Juszczak, E., Dodd, C., Lavis, G., et al. (2002). The prevalence of foot problems in older women: a cause for concern. *J Public Health Med,* 24(2): 77-84.

Dufour, A. B., Broe, K. E., Nguyen, U. S., Gagnon, D. R., Hillstrom, H. J., Walker, A. H., et al. (2009). Foot pain: is current or past shoewear a factor? *Arthritis Rheum,* 61(10): 1352-1358.

Dunn, J. E., Link, C. L., Felson, D. T., Crincoli, M. G., Keysor, J. J., & McKinlay, J. B. (2004). Prevalence of foot and ankle conditions in a multiethnic community sample of older adults. *Am J Epidemiol,* 159(5): 491-498.

Edwards, R. R., Almeida, D. M., Klick, B., Haythornthwaite, J. A., & Smith, M. T. (2008). Duration of sleep contributes to next-day pain report in the general population. *Pain,* 137(1): 202-207.

Elbaz, A., Mirovsky, Y., Mor, A., Enosh, S., Debbi, E., Segal, G., & Debi, R. (2009). A novel biomechanical device improves gait pattern in patient with chronic nonspecific low back pain. *Spine (Phila Pa 1976),* 34(15): 507-512.

Finestone, A., Shlamkovitch, N., Eldad, A., Wosk, J., Laor, A., Danon, Y. L., & Milgrom, C. (1991). Risk factors for stress fractures among Israeli infantry recruits. *Mil Med,* 156(10): 528-530.

Fjell, Y., Alexanderson, K., Karlqvist, L., & Bildt, C. (2007). Self-reported musculoskeletal pain and working conditions among employees in the Swedish public sector. *Work,* 28(1): 33-46.

Frey, C. (2000). Foot health and shoewear for women. *Clin Orthop Relat Res* 372: 32-44.

Garrow, A. P., Papageorgiou, A. C., Silman, A. J., Thomas, E., Jayson, M. I., & Macfarlane, G. J. (2000). Development and validation of a questionnaire to assess disabling foot pain. *Pain,* 85(1-2): 107-113.

Garrow, A. P., Papageorgiou, A., Silman, A. J., Thomas, E., Jayson, M. I., & Macfarlane, G. J. (2001). The grading of hallux valgus. The Manchester Scale. *J Am Podiatr Med Assoc,* 91(2): 74-78.

Garrow, A. P., Silman, A. J., & Macfarlane, G. J. (2004). The Cheshire Foot Pain and Disability Survey: a population survey assessing prevalence and associations. *Pain,* 110(1-2): 378-384.

Golightly, Y. M., Hannan, M. T., Shi, X. A., Helmick, C. G., Renner, J. B., & Jordan, J. M. (2011). Association of foot symptoms with self-reported and performance-based measures of physical function: The Johnston County osteoarthritis project. *Arthritis Care Res (Hoboken),* 63(5): 654-659.

Gross, K. D., Felson, D. T., Niu, J., Hunter, D. J., Guermazi, A., Roemer, F. W., & Hannan, M. T. (2011). Association of flat feet with knee pain and cartilage damage in older adults. *Arthritis Care Res (Hoboken),* 63(7): 937-944.

Hernandez, A. J., Kimura, L. K., Laraya, M. H. F., & Favaro, E. (2007). Calculation of staheli's plantar arch index and prevalence of flat feet: a study with 100 children aged 5-9 years. *Acta Ortop Bras,* 15(2): 68-71.

Hetsroni, I., Finestone, A., Milgrom, C., Sira, D. B., Nyska, M., Radeva-Petrova, D., & Ayalon, M. (2006). A prospective biomechanical study of the association between foot pronation and the incidence of anterior knee pain among military recruits. *J Bone Joint Surg Br,* 88(7): 905-908.

Hill, C. L., Gill, T. K., Menz, H. B., & Taylor, A. W. (2008). Prevalence and correlates of foot pain in a population-based study: the North West Adelaide health study. *J Foot Ankle Res,* 1(1): 2.

Hodge, M. C., Bach, T. M., & Carter, G. M. (1999). Novel Award First Prize Paper. Orthotic management of plantar pressure and pain in rheumatoid arthritis. *Clin Biomech (Bristol, Avon),* 14(8): 567-575.

Hoffman, D. L., & Dukes, E. M. (2008). The health status burden of people with fibromyalgia: a review of studies that assessed health status with the SF-36 or the SF-12. *Int J Clin Pract,* 62(1): 115-126.

Iridiastadi, H., & Nussbaum, M. A. (2006). Muscle fatigue and endurance during repetitive intermittent static efforts: development of prediction models. *Ergonomics,* 49(4): 344-360.

Irving, D. B., Cook, J. L., Young, M. A., & Menz, H. B. (2007). Obesity and pronated foot type may increase the risk of chronic plantar heel pain: a matched case-control study. *BMC Musculoskelet Disorder* 8: 41.

Janchai, S., Boonhong, J., & Tiamprasit, J. (2008). Comparison of removable rigid dressing and elastic bandage in reducing the residual limb volume of below knee amputees. *J Med Assoc Thai,* 91(9): 1441-1446.

Janwantanakul, P., Pensri, P., Jiamjarasrangsri, V., & Sinsongsook, T. (2007). *Prevalence, Contributed factors, and Economic loss related with self-reported musculoskeletal symptoms among office workers.* The research and development unit, Social security office, Thailand. [Translation from Thai].

Janwantanakul, P., Pensri, P., Jiamjarasrangsri, V., & Sinsongsook, T. (2008). Prevalence of self-reported musculoskeletal symptoms among office workers. *Occup Med (Lond)*, 58(6): 436-438.

Janwantanakul, P., Pensri, P., Jiamjarasrangsi, W., & Sinsongsook, T. (2009). Biopsychosocial factors are associated with high prevalence of self-reported musculoskeletal symptoms in the lower extremities among office workers. *Arch Med Res*, 40(3): 216-222.

Kanatli, U., Yetkin, H., & Cila, E. (2001). Footprint and radiographic analysis of the feet. *J Pediatr Orthop*, 21(2): 225-228.

Kanatli, U., Gozil, R., Besli, K., Yetkin, H., & Bolukbasi, S. (2006). The relationship between the hindfoot angle and the medial longitudinal arch of the foot. *Foot Ankle Int*, 27(8): 623-627.

Keenan, A. M., Redmond, A. C., Horton, M., Conaghan, P. G., & Tennant, A. (2007). The Foot Posture Index: Rasch analysis of a novel, foot-specific outcome measure. *Arch Phys Med Rehabil*, 88(1): 88-93.

Keysor, J. J., Dunn, J. E., Link, C. L., Badlissi, F., & Felson, D. T. (2005). Are foot disorders associated with functional limitation and disability among community-dwelling older adults? *J Aging Health*, 17(6): 734-752.

Korpelainen, R., Orava, S., Karpakka, J., Siira, P., & Hulkko, A. (2001). Risk factors for recurrent stress fractures in athletes. *Am J Sports Med*, 29(3): 304-310.

Kruizinga, C. P., Boonstra, A. M., Groothoff, J. W., Elzinga, A., & Goeken, L. N. (2002). Health complaints and disabilities in patients supplied with foot orthoses for degenerative foot disorders. *Prosthet Orthot Int*, 26(3): 235-242.

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sorensen, F., & Andersson, G., et al. (1987). Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon*, 18(3): 233-237.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1): 159-174.

Leino, T., Tammilehto, L., Hytonen, M., Sala, E., Paakkulainen, H., & Kanerva, L. (1998). Occupational skin and respiratory diseases among hairdressers. *Scand J Work Environ Health*, 24(5): 398-406.

Lin, Y. H., Chen, C. Y., & Cho, M. H. (2012). Effectiveness of leg movement in reducing leg swelling and discomfort in lower extremities. *Appl Ergon,* 43(6): 1033-1037.

Machin, D. and Campbell, M.J. (2005). *Design of Studies for medical research*. England: John Wiley & Sons Ltd.

Madeleine, P., Voigt, M., & Arendt-Nielsen, L. (1998). Subjective, physiological and biomechanical responses to prolonged manual work performed standing on hard and soft surfaces. *Eur J Appl Physiol Occup Physiol*, 77(1-2): 1-9.

Mahdi, S.A. & Mahmood, A. (2006). Foot prints: Comparison between urban and rural young females. *Scientific studies,* 1(1): 1-6.

Manorath, P. and Maton, T. (2009). *Health promoting behaviors of Thai elders: a case study of pre-retirement teachers in Uttaradit.* Report of Uttaradit province: Thailand.

Marshall, J. C. & Hales, L. W. (1972). *Essentials of Testing.* Calf: Addison-Wesley.

McCrory, J., Schwass, J., Connell, R., & Cavanagh, P. (1997). In-shoe force measurements from locomotion in simulated zero gravity during parabolic flight. *Clin Biomech (Bristol, Avon),* 12(3): S7.

McDaniel, G., Renner, J. B., Sloane, R., & Kraus, V. B. (2011). Association of knee and ankle osteoarthritis with physical performance. [Research Support, N.I.H., Extramural]. *Osteoarthritis Cartilage*, 19(6): 634-638.

Meijsen, P., & Knibbe, H. J. (2007). Prolonged standing in the OR: a Dutch research study. *AORN J,* 86(3): 399-414.

Menz, H. B., & Sherrington, C. (2000). The Footwear Assessment Form: a reliable clinical tool to assess footwear characteristics of relevance to postural stability in older adults. *Clin Rehabil,* 14(6) : 657-664.

Menz, H. B., & Lord, S. R. (2001). The contribution of foot problems to mobility impairment and falls in community-dwelling older people. *J Am Geriatr Soc,* 49(12): 1651-1656.

Menz, H. B., & Morris, M. E. (2005). Determinants of disabling foot pain in retirement village residents. *J Am Podiatr Med Assoc,* 95(6): 573-579.

Menz, H. B., Morris, M. E., & Lord, S. R. (2006). Footwear characteristics and risk of indoor and outdoor falls in older people. *Gerontology,* 52(3): 174-180.

Menz, H. B., Morris, M. E., & Lord, S. R. (2006). Foot and ankle risk factors for falls in older people: a prospective study. *J Gerontol A Biol Sci Med Sci*, 61(8): 866-870.

Menz, H. B., Tiedemann, A., Kwan, M. M., Plumb, K., & Lord, S. R. (2006). Foot pain in community-dwelling older people: an evaluation of the Manchester Foot Pain and Disability Index. *Rheumatology (Oxford),* 45(7): 863-867.

Menz, H. B., Zammit, G. V., & Munteanu, S. E. (2007). Plantar pressures are higher under callused regions of the foot in older people. *Clin Exp Dermatol*, 32(4): 375-380.

Merriman, L., Griffiths, C., & Tollafield, D. (1987). Plantar Lesion Patterns. *Chiropodist* 42: 145-148.

Messing, K., Tissot, F., & Stock, S. (2008). Distal lower-extremity pain and work postures in the Quebec population. *Am J Public Health*, 98(4): 705-713.

Mickle, K. J., Munro, B. J., Lord, S. R., Menz, H. B., & Steele, J. R. (2010). Foot pain, plantar pressures, and falls in older people: a prospective study. *J Am Geriatr Soc,* 58(10): 1936-1940.

Mickle, K. J., Munro, B. J., Lord, S. R., Menz, H. B., & Steele, J. R. (2011). Cross-sectional analysis of foot function, functional ability, and health-related quality of life in older people with disabling foot pain. *Arthritis Care Res (Hoboken),* 63(11): 1592-1598.

Mitty, E. (2009). Nursing care of the aging foot. *Geriatr Nurs*, 30(5): 350-354.

Morrison, S. C., & Ferrari, J. (2009). Inter-rater reliability of the Foot Posture Index (FPI-6) in the assessment of the paediatric foot. *J Foot Ankle Res* 2: 26.

Nguyen, U. S., Hillstrom, H. J., Li, W., Dufour, A. B., Kiel, D. P., Procter-Gray, E., & Hannan, M. T. (2010). Factors associated with hallux valgus in a population-based study of older women and men: the MOBILIZE Boston Study. *Osteoarthritis Cartilage,* 18(1): 41-46.

Nix, S. E., Vicenzino, B. T., Collins, N. J., & Smith, M. D. (2012). Characteristics of foot structure and footwear associated with hallux valgus: a systematic review. *Osteoarthritis Cartilage,* 20(10): 1059-1074.

Onodera, A. N., Sacco, I. C., Morioka, E. H., Souza, P. S., de Sa, M. R., & Amadio, A. C. (2008). What is the best method for child longitudinal plantar arch assessment and when does arch maturation occur? *Foot (Edinb),* 18(3): 142-149.

Papuga, M. O., & Burke, J. R. (2011). The reliability of the Associate Platinum digital foot scanner in measuring previously developed footprint characteristics. *J Manipulative Physiol Ther,* 34*(*2): 114-118.

Pensri, P., Janwantanakul, P., & Chaikumarn, M. (2009). Prevalence of self-reported musculoskeletal symptoms in salespersons. *Occup Med (Lond),* 59(7): 499-501.

Pensri, P., Janwantanakul, P., & Chaikumarn, M. (2010). Biopsychosocial factors and musculoskeletal symptoms of the lower extremities of saleswomen in department stores in Thailand. *J Occup Health,* 52(2): 132-141.

Pensri, P., & Janwantanakul, P. (2012). Effectiveness of brief education combined with a home-based exercise program on pain and disability of office workers with chronic low back pain: a pilot study. *Journal of physical therapy science,* 24(2): 217-222.

Poosanthanasarn, N., & Lohachit, C. (2005). The health of workers in a metal autoparts factory in eastern Thailand. *Southeast Asian J Trop Med Public Health,* 36(3): 783-789.

Rao, S., Riskowski, J. L., & Hannan, M. T. (2012). Musculoskeletal conditions of the foot and ankle: assessments and treatment options. *Best Pract Res Clin Rheumatol,* 26(3): 345-368.

Redmond, A. C. (1998). An evaluation of the use of gait plate inlays in the short-term management of the intoeing child. *Foot Ankle Int,* 19(3): 144-148.

Reinking, M. F., Hayes, A. M., & Austin, T. M. (2012). The effect of foot orthotic use on exercise related leg pain in cross country athletes. *Phys Ther Sport,* 13(4): 214-218.

Rovinelli, R. J., & Hambleton, R. K. (1977). On the Use of Content Specialists in the Assessment of Criterion-Referenced Test Item Validity. *Dutch Journal of Educational Research* 2: 49-60.

Roddy, E., Muller, S., & Thomas, E. (2009). Defining disabling foot pain in older adults: further examination of the Manchester Foot Pain and Disability Index. *Rheumatology (Oxford),* 48(8): 992-996.

Roddy, E., Muller, S., & Thomas, E. (2011). Onset and persistence of disabling foot pain in community-dwelling older adults over a 3-year period: a prospective cohort study. *J Gerontol A Biol Sci Med Sci,* 66(4): 474-480.

Rogers, A. E., W. T. Hwang, et al. (2004). "The effects of work breaks on staff nurse performance." *J Nurs Adm,* 34(11): 512-519.

Rothbart, B. A., & Estabrook, L. (1988). Excessive pronation: a major biomechanical determinant in the development of chondromalacia and pelvic lists. *J Manipulative Physiol Ther,* 11(5): 373-379.

Rothbart, B. A. (2006). Relationship of functional leg-length discrepancy to abnormal pronation. *J Am Podiatr Med Assoc,* 96(6): 499-504.

Sgarlato, T. E. (1971). A compendium of podiatric biomechanics. *College of Podiatric Med.,* 265-281.

Shih, Y. F., Wen, Y. K., & Chen, W. Y. (2011). Application of wedged foot orthosis effectively reduces pain in runners with pronated foot: a randomized clinical study. [Randomized Controlled Trial]. *Clin Rehabil,* 25(10): 913-923.

Sneyers, C. J., Lysens, R., Feys, H., & Andries, R. (1995). Influence of malalignment of feet on the plantar pressure pattern in running. *Foot Ankle Int,* 16(10): 624-632.

Somrongthong, R., & Yamarat, K. (2011). The conclusion of implementation of health promotion situation: Aging cases. Bangkok: Chulalongkorn University [Translation from Thai].

Spink, M. J., Menz, H. B., & Lord, S. R. (2008). Efficacy of a multifaceted podiatry intervention to improve balance and prevent falls in older people: study protocol for a randomised trial. *BMC Geriatric* 8: 30.

Spink, M. J., Menz, H. B., & Lord, S. R. (2009). Distribution and correlates of plantar hyperkeratotic lesions in older people. *J Foot Ankle Res* 2: 8.

Spink, M. J., Fotoohabadi, M. R., & Menz, H. B. (2010). Foot and ankle strength assessment using hand-held dynamometry: reliability and age-related differences. *Gerontology,* 56(6): 525-532.

Spink, M. J., Menz, H. B., Fotoohabadi, M. R., Wee, E., Landorf, K. B., Hill, K. D., et al. (2011). Effectiveness of a multifaceted podiatry intervention to prevent falls in community dwelling older people with disabling foot pain: randomised controlled trial. *BMJ* 342: d3411.

Staheli, L. T., Chew, D. E., & Corbett, M. (1987). The longitudinal arch. A survey of eight hundred and eighty-two feet in normal children and adults. *J Bone Joint Surg Am,* 69(3): 426-428.

Tencer, A. F., Koepsell, T. D., Wolf, M. E., Frankenfeld, C. L., Buchner, D. M., Kukull, W. A., et al. (2004). Biomechanical properties of shoes and risk of falls in older adults. *J Am Geriatr Soc,* 52(11): 1840-1846.

Theobald, H. (2012). Home-based care provision within the German welfare mix. *Health Soc Care Community,* 20(3): 274-282.

Thomas, M. J., Roddy, E., Zhang, W., Menz, H. B., Hannan, M. T., & Peat, G. M. (2011). The population prevalence of foot and ankle pain in middle and old age: a systematic review. *Pain,* 152(12): 2870-2880.

Tuchsen, F., Hannerz, H., Burr, H., & Krause, N. (2005). Prolonged standing at work and hospitalisation due to varicose veins: a 12 year prospective study of the Danish population. *Occup Environ Med,* 62(12): 847-850.

Tucker, P., D. Lombardi, et al. (2006). "The impact of rest breaks on temporal trends in injury risk." *Chronobiol Int* 23(6): 1423-1434.

Udomprasertkul, V., Bunbundanchai, R., & Vimuktaya S. (2010). Health Survrillance of Personnel in Chulalongkorn University. Health Examination Report: Chulalongkorn University, Thailand. [Translate from Thai].

Urry, S., & Wearing, S. (2005). Arch indexes from ink footprints and pressure platforms are different. *The Foot,* 15(2): 68-73.

Ware, J., Jr., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care,* 34(3): 220-233.

Werner, R. A., Gell, N., Hartigan, A., Wiggermann, N., & Keyserling, W. M. (2010). Risk factors for foot and ankle disorders among assembly plant workers. *Am J Ind Med,* 53(12): 1233-1239.

Wiktorin, C. and L. Karlqvist, et al. (1993). "Validity of self-reported exposures to work postures and manual materials handling. Stockholm MUSIC I Study Group." *Scand J Work Environ Health* 19(3): 208-214.

Wilken, J. M., Rodriguez, K. M., Brawner, M., & Darter, B. J. (2012). Reliability and Minimal Detectible Change values for gait kinematics and kinetics in healthy adults. *Gait Posture,* 35(2): 301-307.

Wilson A. (2002). *Effective management of musculoskeletal injury: a clinical ergonomics approach to prevention, treatment and rehabilitation.* Report of Ergonomics Edinburgh (UK): Churchill Livingstore.

Wilson, D., Tucker, G., & Chittleborough, C. (2002). Rethinking and rescoring the SF-12. *Soz Praventivmed,* 47(3): 172-177.

Wilson, M. L., Rome, K., Hodgson, D., & Ball, P. (2008). Effect of textured foot orthotics on static and dynamic postural stability in middle-aged females. *Gait Posture,* 27(1): 36-42.

Yamsri, C., Pensri P. (2011). *Effect of elastic therapeutic taping combined with stretching on heel pain and foot disability in persons with plantar fasciitis.* Master's Thesis, Department of physical therapy, Faculty of Allied Health Sciences, Chulalongkorn University.

APPENDICES

APPENDIX A

Time Schedule

Thesis Plan	2012					2013				
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1. Literature review	■									
2. Writing thesis proposal		■	■	■						
3. Proposal exam					■					
4. Ethical consideration from Chulalogkorn University (CPHS)					■	■				
5. Pretest questionnaire						■				
6. Field preparation and data collection							■	■		
7. Data analysis								■		
8. Thesis and article writing								■	■	
9. Final thesis exam									■	
10. Submission of article for publication									■	
11. Submission of thesis										■

APPENDIX B

Budget

No.	ACTIVITIES	PRICE (BAHT)
1	Traveling Expenditure	5,000
2	Pre-testing	
	- Photocopy questionnaires	1,000
	- Stationery	1,000
	- Participants Expenditure (30 persons X 200 baht)	6,000
	- Miscellaneous Expenditure	6,000
3	Data collection	
	- Photocopy questionnaires	6,000
	- Stationery	3,000
	- Participants Expenditure (60 persons X 200 baht)	12,000
	- Miscellaneous Expenditure	30,000
4	Document Printing	
	- Paper + Printing	5,000
	- Stationery	2,000
	Total	**77,000**

APPENDIX C

Screening Test

Name.....Age.....years

1. General Information (Please mark ✓ in the selected answer)

Have you been working at Chulalongkorn University more than 1 year?

( ) Yes ( ) No

2. Medical History (Please mark ✓ in the selected answer)

( ) 2.1 No medical conditions

( ) 2.2 Have these medical conditions: *(can select more than 1 answer)*

[….] Currently foot pain with the cause of foot injury from the accident (i.e. ankle sprain, open wound at ankle or foot etc.) for the last 1 month

[….] History of foot fracture and/or history of foot operation

[….] Foot osteoarthritis

[….] Congenital spine abnormality

[….] Congenital foot abnormality

[….] Rheumatoid arthritis

[….] Systemic Lupus Erythematosus (SLE)

[….] Gout

[….] Diabetes mellitus

[….] Osteoporosis

[….] Neurological diseases (i.e. stroke, Parkinson's disease)

[….] Others. Please specify……..

แบบคัดกรอง

( )

ชื่อ-นามสกุล.....อายุ.....ปี

1. ข้อมูลทั่วไป (กรุณาทำเครื่องหมาย ✓ หน้าคำตอบที่ท่านเลือก)

ท่านทำงานที่จุฬาลงกรณ์มหาวิทยาลัยมาต่อเนื่องอย่างน้อย 1 ปี ใช่หรือไม่

( ) ใช่ ( ) ไม่ใช่

2. ประวัติทางการแพทย์ (กรุณาทำเครื่องหมาย ✓ หน้าคำตอบที่ท่านเลือก)

( ) 2.1 ไม่มีโรคประจำตัวใดๆ

( ) 2.2 มีภาวะหรือโรคต่อไปนี้ (ตอบได้มากกว่า 1 ข้อ)

[….] ขณะนี้ มีอาการปวดบริเวณเท้า <u>เนื่องจากอุบัติเหตุ</u> (เช่น ข้อเท้าแพลง เป็นแผลเปิดที่เท้า) ภายในระยะเวลา 1 เดือน

[….] เคยได้รับการผ่าตัดบริเวณเท้ามาก่อน

[….] เคยมีการหักของกระดูกเท้า

[….] มีภาวะความผิดปกติของกระดูกสันหลังแต่กำเนิด (ได้รับการวินิจฉัยจาก แพทย์)

[….] มีภาวะความผิดปกติของกระดูกเท้า (ได้รับการวินิจฉัยจากแพทย์)

[….] มีภาวะเสื่อมของกระดูกเท้า (ได้รับการวินิจฉัยจากแพทย์)

[….] เป็นโรคข้ออักเสบรูมาตอยด์

[….] เป็นโรคในกลุ่มแพ้ภูมิตนเอง (systemic lupus erythematosus)

[….] มีภาวะกระดูกพรุนหรือบาง (ได้รับการวินิจฉัยจากแพทย์)

[….] เป็นโรคเกาต์ (ได้รับการวินิจฉัยจากแพทย์)

[….] เป็นโรคเบาหวาน (ได้รับการวินิจฉัยจากแพทย์)

[….] มีโรคทางระบบประสาท (เส้นเลือดในสมองตีบ/แตก/ตัน, พาร์คินสัน)

[….] อื่นๆ โปรดระบุ.....

APPENDIX D

Questionnaire

ID……..…
Date……..…….

Instruction

- The Questionnaire consists of 6 parts

Part I Individual Information

Part II Work-related Physical Information

Part III Health Behavior Information

Part IV Health-related Quality of life Information

Part V History of Musculoskeletal disorders in low back and lower extremities during the last 12 months

Part VI Foot pain and disability Information (For the persons with foot pain only)

- Please answer all questions by select only 1 answer or fill the short message in the blank. Select the best answer to describe your self
- Some questions have more than 1 answer, we will notify in the end of each sentence

Thank you for your kind cooperation

Part I Individual Information

Instruction Please answer all questions or fill the short message in the blank. Select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.

---

1. Gender [....] 1. Male [....] 2. Female

2. Workplace.....

3. Marital Status [....] 1. Single
   [....] 2. Married
   [....] 3. Widowed
   [....] 4. Others. Please specify.....

4. Education Level [....] 1. Secondary school
   [....] 2. High school
   [....] 3. Diploma
   [....] 4. Undergraduate
   [....] 5. Higher undergraduate
   [....] 6. Others. Please specify.....

5. During the last 12 months the average sleeping duration per day…...…..hours/day.

6. During the last 12 months have you ever fall?
   [....] 1. No.
   [....] 2. Yes. Please specify……times

Part II Work-related physical Information

Instruction Please answer all questions or fill the short message in the blank. Select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.

---

1. Current Job.....
2. Working Experience at Chulalongkorn University.....years…….months
3. During the last 12 months your average working duration at Chulalongkorn University about……..hours per day; and……..days per week.
4. Which are your working postures in **every day**?

Item	Yes	No
4.1 Prolong sitting more than 2 hours		
4.2 Prolong standing more than 2 hours		
4.3 Walking for long distance (the sum of distance approximately more than 2 km per day)		
4.4 Lifting more than 5 kg		
4.5 Stair Climbing at least 20 steps		

5. Your average working duration in these postures;
   - 5.1 **Walking** about….....hours….....minutes per day
   - 5.2 **Sitting** about….....hours….....minutes per day
   - 5.3 **Standing** about….....hours….....minutes per day

6. Do you have time break during working?
   - [....] 1. Yes. Approximately more than or equal 10 minutes in every 2 hours.
   - [....] 2. Yes. Approximately less than 10 minutes in every 2 hours.
   - [....] 3. No.

7. Which items can use to describe your working environment?

Item	Yes	No
7.1 Without loud voice disturbing		
7.2 Appropriate temperature in your room; not too much cold and hot		
7.3 Enough lighting in your working environment		
7.4 Good air ventilation		

Part III Health Behavior Information

Instruction Please answer all questions or fill the short message in the blank. Select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.

---

1. During the last 12 months how often do you exercise per week? (**Exercise** refer to the continuously body movement at least 30 minutes until fatigue level or high energy intake level)

   [....] 1. No. (**Skip to question No.3)**

   [....] 2. Yes, less than 3 times per week.

   [....] 3. Yes, more than or equal 3 times per week.

2. Which types of exercise you do with the most frequent (select only 1 answer)?

   [....] 1. Walking [....] 2. Running

   [....] 3. Swimming [....] 4. Ride the bicycle

   [....] 5. Others. Please specify.....

3. Currently Smoking

   [....] 1. No Smoking.

   [....] 2. No Smoking, but be in the area with smoking.

   [....] 3. Smoking. Approximately……sticks per day.

   [....] 4. Have history of smoking in the past.

4. Follow by these activities, which activities you **always do**?

Item	**Yes**	**No**
4.1 General self-foot assessment (i.e. callus, nail, skin color check) *at least 1 time per week*		
4.2 Apply moisture to your foot skin by Lotion/Oil *every day*		
4.3 Foot soaking *at least 1 time per week*		
4.4 Nail cut straight and not deeply to your nail bed		
4.5 Foot massage *at least 1 time per week*		
4.6 Foot or Calf stocking *every day*		
4.7 Foot exercise to improve flexibility or increase strength *at least 3 times per week*		

5. General characteristics of your shoe with ***the most frequent use***

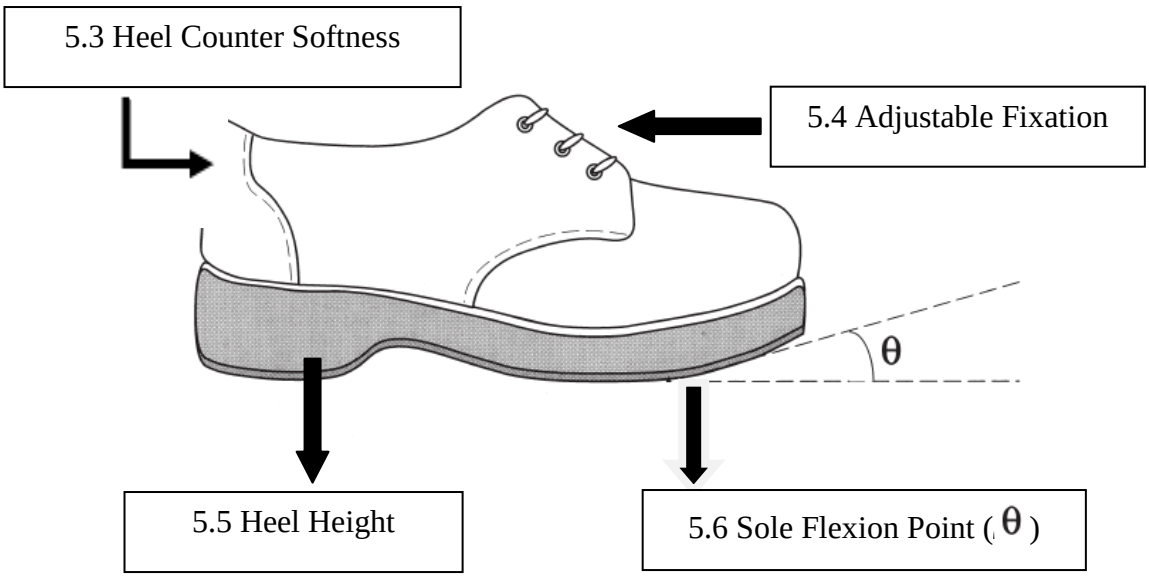
5.1 Do you think your shoe with the most frequent use is **appropriate with your foot size**?

[....] 1. Too small shoe [....] 2. Appropriate size

[....] 3. Too large shoe

5.2 How about **the insole of your shoe** with the most frequent use?

[....] 1. Comfortable Soft [....] 2. Hard



5.3 From the figure, how about the **heel counter** of your shoe?

[....] 1. Comfortable Soft [....] 2. Hard

[....] 3. No heel counter

5.4 From the figure, do you have **adjustable fixation** in your shoe?

[....] 1. Yes [....] 2. No

5.5 From the figure, what is approximately **heel height** of your shoe?

[....] 1. 0 - 2.5 cm [....] 2. 2.5 – 5.0 cm

[....] 3. More than 5.0 cm

5.6 From the figure, do you have **sole flexion point (θ)** in your shoe?

[....] 1. Yes [....] 2. No

Part IV Health-related Quality of life Information

Instruction Please answer all questions or fill the short message in the blank. Select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.

---

1. In general, would you say your health is:

[....] 1. Excellent [....] 2. Very good [....] 3. Good

[....] 4. Fair [....] 5. Poor

2. The following two questions are about activities you might do during a typical day. Does YOUR HEALTH NOW LIMIT YOU in these activities? If so, how much?

Item	**Level of your opinion**		
	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
2.1 MODERATE ACTIVITIES, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf:			
2.2 Climbing SEVERAL flights of stairs:			

3. The next three questions are about how you feel and how things have been DURING THE PAST 4 WEEKS. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the PAST 4 WEEKS –

Item	**Level of your opinion**					
	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
3.1 Have you felt calm and peaceful?						
3.2 Did you have a lot of energy?						
3.3 Have you felt downhearted and blue?						

4. During the PAST 4 WEEKS, were you limited in the kind of work you do or other regular activities AS A RESULT OF ANY EMOTIONAL PROBLEMS (such as feeling depressed or anxious)?

Item	Level of your opinion	
	Yes	**No**
4.1 ACCOMPLISHED LESS than you would like		
4.2 Didn't do work or other activities as CAREFULLY as usual		

5. During the PAST 4 WEEKS have you had any of the following problems with your work or other regular activities AS A RESULT OF YOUR PHYSICAL HEALTH?

Item	Level of your opinion	
	Yes	**No**
5.1 ACCOMPLISHED LESS than you would like:		
5.2 Were limited in the KIND of work or other activities:		

6. During the PAST 4 WEEKS, how much did PAIN interfere with your normal work (including both work outside the home and housework)?

[....] 1. Not At All [....] 2. A Little Bit [....] 3. Moderately

[....] 4. Quite A Bit [....] 5. Extremely

7. During the PAST 4 WEEKS, how much of the time has your PHYSICAL HEALTH OR EMOTIONAL PROBLEMS interfered with your social activities (like visiting with friends, relatives, etc.)?

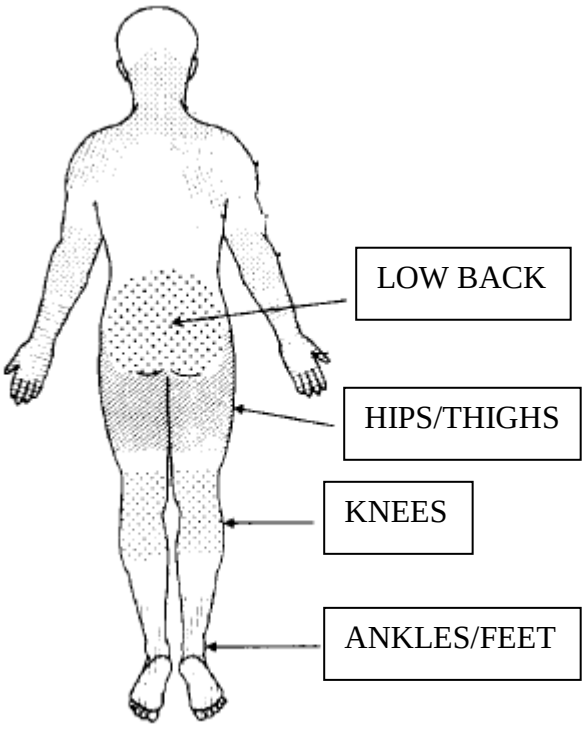
[....] 1. All of the Time [....] 2. Most of the Time

[....] 3. A Good Bit of the Time [....] 4. Some of the Time

[....] 5. None of the Time

Part V History of Musculoskeletal disorders of low back and lower extremities during the past 12 months.

Instruction Please answer all questions or fill the short message in the blank. Select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.



1. **During the last 12 months**, do you have any ache, pain, numbness, weakness or discomfort more than 1 day in these areas?
   1.1 **Low back** (From body chart)
   [....] 1. No [....] 2. Yes
   1.2 **Hips/Thighs** (From body chart)
   [....] 1. No [....] 2. Yes
   1.3 **Knees** (From body chart)
   [....] 1. No [....] 2. Yes
2. **During the past month**, do you have any ache, pain, numbness, weakness or discomfort more than 1 day at ankles/feet?
   [....] 1. No.....*(end of questionnaire)*…….
   [....] 2. Yes. Please specify the side (i.e. Left, Right, or Both)……

Part VI Foot pain and disability Information ***(For the persons with foot pain only)***

Instruction Please select the best answer to describe yourself by marking ✓ in the blank ***only 1 answer***.

Because of pain in my feet:	**During the past month**		
	None of the time	**On some days**	**On most/ every day**
I avoid walking outside at all			
I avoid walking long distances			
I don't walk in a normal way			
I walk slowly			
I have to stop and rest my feet			
I avoid hard or rough surfaces when possible			
I avoid standing for a long time			
I catch the bus or use the car more often			
I need help with housework/shopping			
I still do everything but with more pain or discomfort			
I get irritable when my feet hurt			
I feel self-conscious about the shoes I have to wear			
I get self conscious about the shoes I have to wear			
I have constant pain in my feet			
My feet are worse in the morning			
My feet are more painful in the evening			
I get shooting pains in my feet			

แบบสอบถามเรื่อง

“คุณภาพชีวิต และปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าในบุคลากรวัยก่อนเกษียณอายุของจุฬาลงกรณ์มหาวิทยาลัย ประเทศไทย”

เลขที่แบบสอบถาม.....

วัน เดือน ปี ที่เก็บข้อมูล.....

คำชี้แจง

- แบบสอบถามนี้แบ่งออกเป็น 6 ส่วน ได้แก่
  ส่วนที่ 1 ข้อมูลส่วนบุคคล
  ส่วนที่ 2 ข้อมูลเกี่ยวกับลักษณะงานประจำของท่าน
  ส่วนที่ 3 ข้อมูลเกี่ยวกับพฤติกรรมทางด้านสุขภาพ
  ส่วนที่ 4 ข้อมูลด้านจิตใจและสังคมสิ่งแวดล้อม
  ส่วนที่ 5 ข้อมูลเกี่ยวกับการบาดเจ็บทางระบบกระดูกและกล้ามเนื้อบริเวณหลังส่วนบั้นเอวและระยางค์ส่วนขา ในรอบ 12 เดือนที่ผ่านมา
  ส่วนที่ 6 ข้อมูลเกี่ยวกับความสามารถในการทำงานของเท้า (สำหรับผู้ที่มีอาการปวดเท้า)

- กรุณาตอบคำถามตามความเป็นจริง โดยเลือกเพียงคำตอบเดียว หรือใส่ข้อความสั้นๆ ที่ตรงกับตัวท่านมากที่สุด
- ในบางคำถามท่านสามารถเลือกตอบได้มากกว่า 1 คำตอบ ซึ่งจะระบุไว้ในท้ายของคำถามข้อนั้น
- **ข้อมูลที่ท่านตอบในแบบสอบถามนี้จะถูกเก็บเป็นความลับ และจะเปิดเผยเฉพาะผลการวิจัยในภาพรวม โดยไม่ระบุชื่อบุคคลใดบุคคลหนึ่งเป็นการเฉพาะ**

ขอขอบพระคุณท่านเป็นอย่างสูงในการให้ความร่วมมือ

ส่วนที่ 1 ข้อมูลส่วนบุคคล

คำชี้แจง กรุณาตอบคำถามตามความเป็นจริงโดยใส่ข้อความสั้นๆ หรือเลือกคำตอบที่สอดคล้องกับความคิดเห็นของท่านมากที่สุด โดยใส่เครื่องหมาย ✓ ใน [....] เพียง 1 คำตอบ

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1. เพศ [....] 1. ชาย [....] 2. หญิง

2. สถานที่ทำงาน.....

3. สถานภาพสมรส [....] 1. โสด
   [....] 2. สมรส
   [....] 3. หม้าย/หย่า/แยก
   [....] 4. อื่นๆ โปรดระบุ.....

4. วุฒิการศึกษาสูงสุด [....] 1. ม.3
   [....] 2. ม.6
   [....] 3. ปวช./ปวท./ปวส.
   [....] 4. ปริญญาตรี
   [....] 5. ปริญญาโท-เอก
   [....] 6. อื่นๆ โปรดระบุ.....

5. ในรอบ 12 เดือนที่ผ่านมา ท่านนอนหลับโดยส่วนใหญ่วันละกี่ชั่วโมง.....ชั่วโมงต่อคืน

6. ในรอบ 12 เดือนที่ผ่านมา ท่านเคยหกล้ม หรือไม่
   [....] 1. ไม่เคย
   [....] 2. เคย โปรดระบุจำนวนครั้ง.....ครั้ง

<u>ส่วนที่ 2</u> ข้อมูลเกี่ยวกับลักษณะงานประจำของท่าน

คำชี้แจง กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยใส่ข้อความสั้นๆ หรือเลือกคำตอบที่สอดคล้องกับความคิดเห็นของท่านมากที่สุด โดยใส่เครื่องหมาย ✓ ใน [....] เพียง 1 คำตอบ *ยกเว้น* บางคำถามสามารถเลือกตอบได้มากกว่า 1 คำตอบ ซึ่งจะระบุไว้ตอนท้ายของคำถามนั้น

1. อาชีพปัจจุบัน (ลักษณะงาน).....
2. ท่านทำงานที่จุฬาลงกรณ์มหาวิทยาลัยมาเป็นระยะเวลาทั้งหมด.....ปี.....เดือน
3. <u>ในรอบ 12 เดือนที่ผ่านมา</u> ท่านทำงานที่จุฬาลงกรณ์มหาวิทยาลัย
   โดยประมาณ.....ชั่วโมงต่อวัน เป็นจำนวน.....วันต่อสัปดาห์
4. ท่าทางต่อไปนี้ เป็นท่าทางที่ท่านต้องใช้ **<u>ทุกวัน</u>** ในการทำงาน ใช่หรือไม่

หัวข้อ	ใช่	ไม่ใช่
4.1 นั่งทำงานอยู่กับที่ ติดต่อกันเป็นเวลานานกว่า 2 ชั่วโมง		
4.2 ยืนทำงานอยู่กับที่ ติดต่อกันเป็นเวลานานกว่า 2 ชั่วโมง		
4.3 เดินในระยะทางที่ไกล (รวมระยะทางโดยประมาณมากกว่า 2 กิโลเมตรต่อวัน)		
4.4 ยก/หิ้วของหนักมากกว่า 5 กิโลกรัม		
4.5 เดินขึ้น-ลงบันไดอย่างน้อย 20 ขั้น		

5. ระยะเวลาโดยเฉลี่ยที่ท่านใช้ในการทำงาน ในท่าทางดังต่อไปนี้
   5.1 **<u>ท่าเดิน</u>** โดยประมาณ….....ชั่วโมง….....นาที ต่อวัน
   5.2 **<u>ท่านั่ง</u>** โดยประมาณ….....ชั่วโมง….....นาที ต่อวัน
   5.3 **<u>ท่ายืน</u>** โดยประมาณ….....ชั่วโมง….....นาที ต่อวัน
6. ท่านมีการพักระหว่างปฏิบัติงานเป็นระยะหรือไม่
   [....] 1. ใช่ โดยประมาณมากกว่าหรือเท่ากับ 10 นาที ทุกๆ 2 ชั่วโมง
   [....] 2. ใช่ โดยประมาณน้อยกว่า 10 นาที ทุกๆ 2 ชั่วโมง
   [....] 3. ไม่ใช่
7. ท่านเห็นว่า ที่ทำงานของท่านมีลักษณะตรงกับข้อใดบ้าง

หัวข้อ	ใช่	ไม่ใช่
7.1 ห้องทำงานไม่มีเสียงดังรบกวน		
7.2 อุณหภูมิในห้องทำงานไม่ร้อนหรือเย็นจนเกินไป		
7.3 แสงสว่างในการทำงานเพียงพอ		
7.4 ห้องทำงานมีอากาศถ่ายเทดี		

ส่วนที่ 3 ข้อมูลเกี่ยวกับพฤติกรรมทางด้านสุขภาพ

คำชี้แจง กรุณาตอบคำถามตามความเป็นจริง โดยใส่ข้อความสั้นๆ หรือเลือกคำตอบที่สอดคล้องกับความคิดเห็นของท่านมากที่สุด โดยใส่เครื่องหมาย ✓ ใน [....] เพียง 1 คำตอบ *ยกเว้น* บางคำถามสามารถเลือกตอบได้มากกว่า 1 คำตอบ ซึ่งจะระบุไว้ตอนท้ายของคำถามนั้น

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1. ในรอบ 12 เดือนที่ผ่านมา ท่านออกกำลังกายบ่อยแค่ไหน (การออกกำลังกาย หมายถึง การเคลื่อนไหวร่างกายอย่างต่อเนื่องอย่างน้อย 30 นาที หรือจนรู้สึกเหนื่อย เพื่อเสริมสร้างสุขภาพร่างกายให้แข็งแรงโดยกระทำในยามว่างหรือเป็นงานอดิเรก เช่น เดินเร็ว วิ่ง ว่ายน้ำ หรือ เล่นกีฬาอื่นๆ เป็นต้น)
   - [....] 1. ไม่ได้ทำ (**ข้ามไปตอบข้อ 3)**
   - [....] 2. ทำบ้าง แต่น้อยกว่า 3 ครั้งต่อสัปดาห์
   - [....] 3. ทำสม่ำเสมอ มากกว่าหรือเท่ากับ 3 ครั้งต่อสัปดาห์
2. ประเภทของการออกกำลังกายที่ท่านทำ**บ่อยที่สุด** (เลือกตอบได้เพียง 1 ข้อ)
   - [....] 1. เดิน [....] 2. วิ่ง [....] 3. ว่ายน้ำ
   - [....] 4. ปั่นจักรยาน [....] 5. อื่นๆ โปรดระบุ.....
3. ท่านสูบบุหรี่ หรือไม่
   - [....] 1. ไม่สูบ
   - [....] 2. ไม่สูบ แต่อยู่ในสถานที่ที่มีการสูบบุหรี่
   - [....] 3. สูบ โปรดระบุจำนวนบุหรี่ที่สูบโดยประมาณ.....มวนต่อวัน
   - [....] 4. เคยสูบ แต่ปัจจุบันไม่ได้สูบแล้ว โปรดระบุจำนวนปีที่หยุดสูบบุหรี่ .....ปี
4. กิจกรรมใดต่อไปนี้ ที่ท่านมักทำ**เป็นประจำ**

หัวข้อ	ใช่	ไม่ใช่
4.1 ตรวจประเมินสุขภาพเท้าด้วยตนเอง (เช่น ตรวจหนังแข็งที่เท้า, ตรวจความผิดปกติของเล็บ, สีผิวของเท้า) *อย่างน้อยสัปดาห์ละ 1 ครั้ง*		
4.2 ทาโลชั่น/ครีม/น้ำมัน เพื่อเพิ่มความชุ่มชื้นให้เท้า *ทุกวัน*		
4.3 แช่เท้าในน้ำ *อย่างน้อยสัปดาห์ละ 1 ครั้ง*		
4.4 ตัดเล็บเท้าตรง ไม่เว้าเข้าเนื้อมากเกินไป		
4.5 นวดฝ่าเท้า *อย่างน้อยสัปดาห์ละ 1 ครั้ง*		
4.6 สวมถุงน่อง หรือถุงเท้า *ทุกวัน*		
4.7 บริหารข้อเท้า นิ้วเท้า เพื่อเพิ่มความยืดหยุ่น และความแข็งแรงของโครงสร้างรอบๆ ข้อเท้า *อย่างน้อย 3 วันต่อสัปดาห์*		

5. ลักษณะโดยทั่วไปของรองเท้าคู่ที่ท่านใส่ ***<u>บ่อยที่สุด</u>***

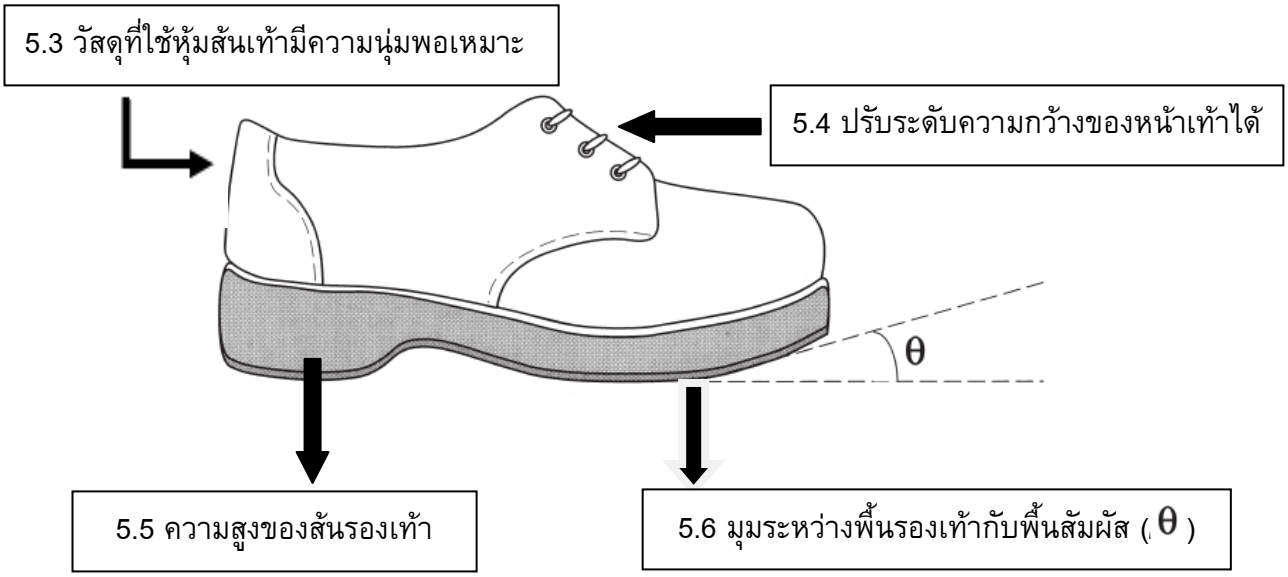
5.1 ท่านคิดว่ารองเท้าคู่ที่ท่านใส่บ่อยที่สุดมี**ขนาดเหมาะสมกับเท้า**ของท่านหรือไม่

[....] 1. รองเท้าขนาดเล็กเกินไป [....] 2. รองเท้าขนาดพอดีกับรูปเท้า

[....] 3. รองเท้าขนาดใหญ่เกินไป

5.2 ท่านคิดว่า **พื้นรองเท้าด้านที่สัมผัสกับฝ่าเท้า** ของคู่ที่ท่านใส่บ่อยที่สุด มีความนุ่มพอเหมาะหรือไม่

[....] 1. มี [....] 2. ไม่มี



5.3 <u>จากรูป</u> ท่านคิดว่า **วัสดุที่ใช้หุ้มส้นเท้า** ของคู่ที่ท่านใส่บ่อยที่สุด **มีความนุ่มพอเหมาะ**หรือไม่

[....] 1. มี [....] 2. ไม่มี

[....] 3. ไม่ได้ใส่รองเท้าหุ้มส้น

5.4 <u>จากรูป</u> รองเท้าคู่ที่ท่านใส่บ่อยที่สุด สามารถ**ปรับระดับความกว้างของหน้าเท้า**ได้หรือไม่

[....] 1. ได้ [....] 2. ไม่ได้

5.5 <u>จากรูป</u> **ความสูงของส้นรองเท้า** โดยประมาณของคู่ที่ท่านใส่บ่อยที่สุด

[....] 1. 0 - 2.5 เซนติเมตร [....] 2. 2.5 – 5.0 เซนติเมตร

[....] 3. มากกว่า 5.0 เซนติเมตร

5.6 <u>จากรูป</u> รองเท้าคู่ที่ท่านใส่บ่อยที่สุด มี**มุมระหว่างพื้นรองเท้ากับพื้นสัมผัส (θ)** หรือไม่

[....] 1. มี [....] 2. ไม่มี

ส่วนที่ 4 ข้อมูลด้านจิตใจและสังคมสิ่งแวดล้อม

คำชี้แจง ข้อความต่อไปนี้เป็นข้อความเกี่ยวกับ**คุณภาพชีวิตของคุณในปัจจุบัน** กรุณาทำเครื่องหมาย ✓ หน้าข้อความที่ใกล้เคียงกับความคิดเห็นของคุณมากที่สุดเพียงคำตอบเดียว

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1. **โดยทั่ว ๆ ไป** ท่านสามารถพูดได้ว่าสุขภาพของท่านเป็นอย่างไร

   [....] 1. ดีเยี่ยม [....] 2. ดีมาก [....] 3. ดี

   [....] 4. ปานกลาง [....] 5. ไม่ดี

2. เรื่องต่อไปนี้เป็นเรื่องเกี่ยวกับกิจกรรมที่ท่านทำในแต่ละวัน ท่านคิดว่าสุขภาพของท่านเป็นปัญหา/อุปสรรคในการทำกิจกรรมของท่านหรือไม่ ถ้าใช่ มากน้อยแค่ไหน

หัวข้อ	ระดับของความคิดเห็น		
	ใช่, เป็นปัญหา/อุปสรรคอย่างมาก	ใช่, เป็นปัญหา/อุปสรรคเพียงเล็กน้อย	ไม่เลย
2.1 **กิจกรรมที่ใช้แรงปานกลาง** เช่น การยกโต๊ะ การทำความสะอาดปัดกวาด เช็ดถูบ้าน หรือหิ้วของกลับจากตลาด			
2.2 การเดินขึ้นตึก **2-3 ชั้น** หรือ**เดินขึ้นเนิน**			

3. คำถามต่อไปนี้เกี่ยวข้องกับความรู้สึก และสิ่งต่างๆ ที่เกิดขึ้นกับท่านในช่วง 1 เดือนที่ผ่านมา กรุณาเลือกคำตอบที่ตรงกับความรู้สึกของท่านมากที่สุดเพียงข้อเดียว

ในช่วง 1 เดือนที่ผ่านมา ท่านมีความรู้สึกต่อไปนี้ บ่อยแค่ไหน	ระดับของความคิดเห็น					
	ตลอดเวลา	เกือบตลอดเวลา	ค่อนข้างบ่อย	บางครั้ง	นานๆ ครั้ง	ไม่เลย
3.1 ท่านรู้สึกใจสงบ ใจนิ่ง มีสมาธิ						
3.2 ท่านรู้สึกแข็งแรง กระปรี้กระเปร่า สดชื่น						
3.3 ท่านรู้สึกเศร้า หดหู่						

4. **ในช่วง 1 เดือนที่ผ่านมา** ท่านเคยมีปัญหาในเรื่องต่อไปนี้กับงานของท่านหรือกิจกรรมที่ทำเป็นประจำทุกวัน เนื่องมาจาก**ปัญหาสุขภาพ**ของท่าน หรือไม่

หัวข้อ	ระดับของความคิดเห็น	
	ใช่	ไม่ใช่
4.1 ทำงานได้**ปริมาณน้อยลง**กว่าที่ต้องการ		
4.2 ไม่สามารถทำงานได้ทุกอย่างตามที่ตั้งใจไว้ ต้องเลือกทำ**บางอย่าง**เท่านั้น		

5. **ในช่วง 1 เดือนที่ผ่านมา** ท่านเคยมีปัญหาในเรื่องต่อไปนี้กับงานของท่านหรือกิจกรรมที่ทำเป็นประจำทุกวัน เนื่องมาจาก**ปัญหาด้านอารมณ์**ของท่าน หรือไม่ (เช่น ความรู้สึกซึมเศร้าหรือวิตกกังวล)

หัวข้อ	ระดับของความคิดเห็น	
	ใช่	ไม่ใช่
5.1 ทำงานได้**ปริมาณน้อยลง**กว่าที่ต้องการ		
5.2 ทำงาน หรือทำกิจกรรมอื่นๆ โดย**ปราศจากความระมัดระวังสับเพร่า เลินเล่อ** อย่างที่เคย		

6. **ในระหว่าง 1 เดือนที่ผ่านมา** ปัญหาการเจ็บปวดตามร่างกายทำให้ท่านไม่สามารถทำงานประจำวันได้ตามปกติ (งานในบ้านและนอกบ้าน) มากน้อยเพียงใด

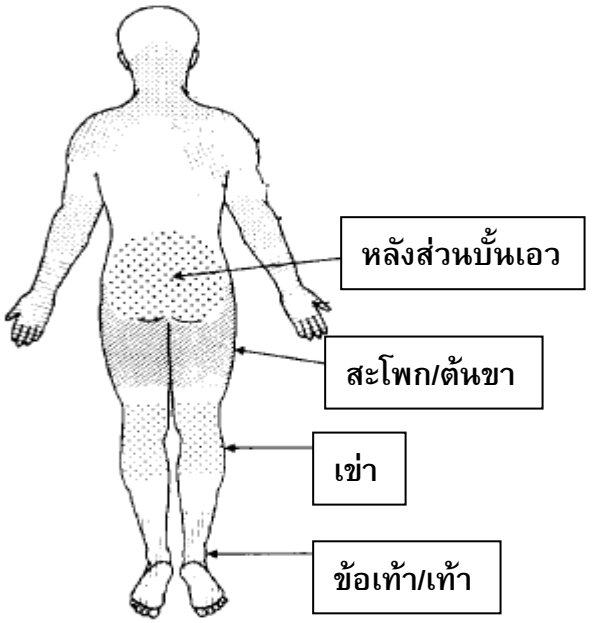
[....] 1. ไม่เลย [....] 2. เล็กน้อย [....] 3. ปานกลาง
[....] 4. ค่อนข้างมาก [....] 5. มากที่สุด

7. **ในระหว่าง 1 เดือนที่ผ่านมา** บ่อยแค่ไหนที่ท่านรู้สึกว่า**ปัญหาทางสุขภาพหรือปัญหาทางอารมณ์**เป็นอุปสรรคขัดขวางการทำกิจกรรมทางสังคมของท่าน (เช่น การไปเยี่ยมเพื่อน หรือญาติสนิท เป็นต้น)

[....] 1. ตลอดเวลา [....] 2. เกือบตลอดเวลา [....] 3. บางครั้ง
[....] 4. นานๆ ครั้ง [....] 5. ไม่เลย

<u>ส่วนที่ 5</u> ข้อมูลเกี่ยวกับการบาดเจ็บทางระบบกระดูกและกล้ามเนื้อบริเวณหลังส่วนบั้นเอวและรยางค์ส่วนขาในรอบ 12 เดือนที่ผ่านมา

คำชี้แจง กรุณาตอบคำถามทุกข้อตามความเป็นจริง โดยเลือกคำตอบที่สอดคล้องกับความคิดเห็นของท่านมากที่สุด โดยใส่เครื่องหมาย ✓ ใน [....] เพียง 1 คำตอบ



1. **<u>ในช่วง 12 เดือนที่ผ่านมา</u>** ท่านเคยมีอาการผิดปกติ เช่น ปวด/รู้สึกไม่สบาย/ชา/อ่อนแรง/ข้อยึด อย่างใดอย่างหนึ่ง เป็นเวลานานกว่า 1 วัน ในบริเวณดังต่อไปนี้ หรือไม่

1.1 **<u>หลังส่วนบั้นเอว</u>** (ดังรูป)

[....] 1. ไม่เคย [....] 2. เคย

1.2 **<u>สะโพก/ต้นขา</u>** ข้างใดข้างหนึ่งหรือทั้งสองข้าง (ดังรูป)

[....] 1. ไม่เคย [....] 2. เคย

1.3 **<u>เข่า</u>** ข้างใดข้างหนึ่งหรือทั้งสองข้าง (ดังรูป)

[....] 1. ไม่เคย [....] 2. เคย

2. <u>ในช่วง 1 เดือนที่ผ่านมา</u> ท่านเคยมีอาการผิดปกติ เช่น ปวด/รู้สึกไม่สบาย/ชา/อ่อนแรง/ข้อยึด อย่างใดอย่างหนึ่ง เป็นเวลานานกว่า 1 วัน ในบริเวณ **<u>ข้อเท้า/เท้า</u>** หรือไม่

[....] 1. ไม่เคย..... *(จบแบบสอบถาม).....*

[....] 2. เคย โปรดระบุข้าง O ซ้าย O ขวา O ทั้ง 2 ข้าง

ส่วนที่ 6 ข้อมูลเกี่ยวกับความสามารถในการทำงานของเท้า ***(สำหรับผู้ที่มีอาการปวดเท้า)***

คำชี้แจง ข้อความต่อไปนี้เกี่ยวกับปัญหาที่เกิดขึ้น เนื่องจากความเจ็บปวดที่เท้า กรุณาอ่านและพิจารณาว่า ข้อความใดบ้างที่ตรงกับปัญหาสุขภาพเท้าของท่านในช่วงเดือนที่ผ่านมา และโปรดทำเครื่องหมาย ✓ ในช่องสี่เหลี่ยมเพียง 1 คำตอบสำหรับแต่ละข้อความ

เนื่องจากความเจ็บปวดที่เท้า:	**ในช่วง 1 เดือนที่ผ่านมา** เกิดสิ่งต่อไปนี้กับฉัน		
	ไม่เคย	**บางวัน**	**เกือบทุกวัน/ทุกวัน**
ฉันหลีกเลี่ยงการเดินออกไปข้างนอกอย่างสิ้นเชิง			
ฉันหลีกเลี่ยงการเดินไกลๆ			
ฉันไม่ได้เดินในท่าปกติ			
ฉันเดินช้า ๆ			
ฉันต้องหยุดเพื่อพักเท้า			
ฉันหลีกเลี่ยงการเดินบนพื้นแข็งหรือขรุขระหากทำได้			
ฉันหลีกเลี่ยงการยืนเป็นเวลานาน			
ฉันโดยสารรถประจำทางหรือใช้รถส่วนตัวบ่อยครั้งขึ้น			
ฉันต้องมีคนช่วยในการทำงานบ้าน/จับจ่ายของ			
ฉันรู้สึกหงุดหงิด/ฉุนเฉียวง่ายเมื่อรู้สึกเจ็บเท้า			
ฉันยังคงทำทุกอย่างแต่รู้สึกเจ็บปวดหรือรู้สึกไม่สบายมากขึ้น			
ฉันรู้สึกเจ็บปวดที่เท้าอยู่ตลอดเวลา			
เท้าของฉันจะมีอาการแย่ลงในตอนเช้า			
เท้าของฉันจะเจ็บปวดมากขึ้นในตอนเย็น			
ฉันรู้สึกเจ็บแปลบในเท้าของฉัน			
ฉันรู้สึกว่าต้องระมัดระวังเกี่ยวกับเท้า			
ฉันรู้สึกว่าต้องระมัดระวังเกี่ยวกับรองเท้าที่สวมใส่			

APPENDIX E

Physical Examination Form

No.....…...

Date..…..…/...……..…/ 2013

Name…….....Age.....years

1. **Body mass index (kg/m^2)**

   Weight = ……kg Height = ……..m

   Height X Height = …….m^2

   BMI = ……..kg/m^2

2. **Waist per hip ratio (WHR)**

   Waist circumference = ……..……cm Hip circumference = ……cm

   WHR = ……..

3. **Foot problem assessment (Menz et al., 2011)**

Lt. side	Rt.side
Callus formation at these areas: □ Big toe □ 2nd- 5th toes □ Fore foot □ Mid foot □ Hind foot (heel)	Callus formation at these areas: □ Big toe □ 2nd- 5th toes □ Fore foot □ Mid foot □ Hind foot (heel)
Hallux valgus/ Bunion □ None □ Mild □ Moderate □ Severe	Hallux valgus/ Bunion □ None □ Mild □ Moderate □ Severe
Lesser toe deformities □ Yes □ No	Lesser toe deformities □ Yes □ No
Others……..	Others……..

Rt. **Lt.**

4. Foot Posture index (Keenan et al., 2007)

	FACTOR	*PLANE*	**SCORE 1** Date_____ Comment_____	
			Left *-2 to +2*	***Right*** *-2 to +2*
Rearfoot	Talar head palpation	*Transverse*		
	Curves above and below the lateral malleolus	*Frontal/ transverse*		
	Inversion/eversion of the calcaneus	*Frontal*		
Forefoot	Prominence in the region of the TNJ	*Transverse*		
	Congruence of the medial longitudinal arch	*Sagittal*		
	Abd/adduction forefoot on rearfoot	*Transverse*		
	TOTAL			

Reference values
Normal = 0 to +5
Pronated = +6 to +9, Highly pronated 10+
Supinated = -1 to –4, Highly supinated –5 to -12

Note……

……

……

5. Foot muscles strength testing

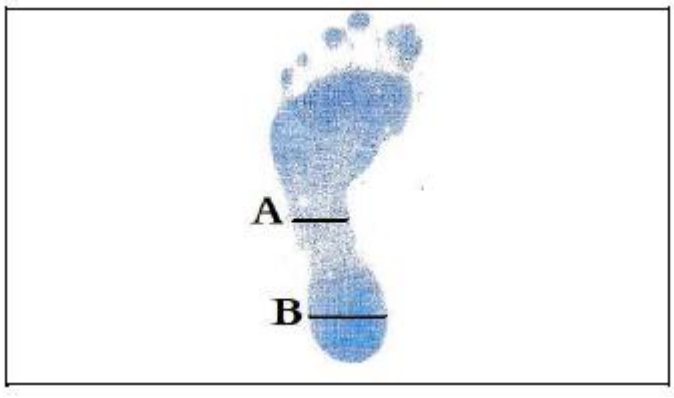
Lt. side	**Rt.side**
PPG1 [….] Pass [….] Fail	**PPG1** [….] Pass [….] Fail
PPG2 [….] Pass [….] Fail	**PPG2** [….] Pass [….] Fail
Ankle plantarflexion grade……	**Ankle plantarflexion** grade……
Ankle dorsiflexion grade……	**Ankle dorsiflexion** grade……

Note……

……

……

6. Staheli's arch index (SAI) from footprint analysis



Lt. side	Rt.side
A = ……..……..….……	A = ……..……..……
B =……..……...…….	B =……..……..……..…….
A/B ratio (SAI) =……...……..……..…	A/B ratio (SAI) =……..…….....……
Foot arch type: • High arch (SAI less than 0.44) • Normal (SAI = 0.44-0.89) • Flat arch (SAI more than 0.89)	Foot arch type: • High arch (SAI less than 0.44) • Normal (SAI = 0.44-0.89) • Flat arch (SAI more than 0.89)

Note……
……
……
…….....……

7. Leg length measurement

Left side…….cm Right side……..cm

APPENDIX F

Approval Ethical consideration committee

AF 01-12

คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย
อาคารสถาบัน 2 ชั้น 4 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330
โทรศัพท์: 0-2218-8147 โทรสาร: 0-2218-8147 E-mail: eccu@chula.ac.th

COA No. 053/2556

ใบรับรองโครงการวิจัย

โครงการวิจัยที่ 196.1/55 : คุณภาพชีวิตและปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าในบุคลากรวัยก่อนเกษียณอายุของจุฬาลงกรณ์มหาวิทยาลัย ประเทศไทย

ผู้วิจัยหลัก : นางสาวภาวิณี หฤทัยชื่น

หน่วยงาน : วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ได้พิจารณา โดยใช้หลัก ของ The International Conference on Harmonization – Good Clinical Practice (ICH-GCP) อนุมัติให้ดำเนินการศึกษาวิจัยเรื่องดังกล่าวได้

ลงนาม.....
(รองศาสตราจารย์ นายแพทย์ปรีดา ทัศนประดิษฐ)
ประธาน

ลงนาม.....
(ผู้ช่วยศาสตราจารย์ ดร.นันทรี ชัยชนะวงศาโรจน์)
กรรมการและเลขานุการ

วันที่รับรอง : 26 กุมภาพันธ์ 2556 **วันหมดอายุ** : 25 กุมภาพันธ์ 2557

เอกสารที่คณะกรรมการรับรอง

1) โครงการวิจัย
2) ข้อมูลสำหรับกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัยและใบยินยอมของกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย
3) ผู้วิจัย
4) แบบสอบถาม

คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1
เลขที่โครงการวิจัย 196.1/55
วันที่รับรอง 26 ก.พ. 2556
วันหมดอายุ 25 ก.พ. 2557

เงื่อนไข

1. ข้าพเจ้ารับทราบว่าเป็นการผิดจริยธรรม หากดำเนินการเก็บข้อมูลการวิจัยก่อนได้รับการอนุมัติจากคณะกรรมการพิจารณาจริยธรรมการวิจัยฯ
2. หากใบรับรองโครงการวิจัยหมดอายุ การดำเนินการวิจัยต้องยุติ เมื่อต้องการต่ออายุต้องขออนุมัติใหม่ล่วงหน้าไม่ต่ำกว่า 1 เดือน พร้อมส่งรายงานความก้าวหน้าการวิจัย
3. ต้องดำเนินการวิจัยตามที่ระบุไว้ในโครงการวิจัยอย่างเคร่งครัด
*4. ใช้เอกสารข้อมูลสำหรับกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย ใบยินยอมของกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย และเอกสารเชิญเข้าร่วมวิจัย (ถ้ามี) **เฉพาะที่ประทับตราคณะกรรมการเท่านั้น***
5. หากเกิดเหตุการณ์ไม่พึงประสงค์ร้ายแรงในสถานที่เก็บข้อมูลที่ขออนุมัติจากคณะกรรมการ ต้องรายงานคณะกรรมการภายใน 5 วันทำการ
6. หากมีการเปลี่ยนแปลงการดำเนินการวิจัย ให้ส่งคณะกรรมการพิจารณารับรองก่อนดำเนินการ
7. โครงการวิจัยไม่เกิน 1 ปี ส่งแบบรายงานสิ้นสุดโครงการวิจัย (AF 03-12) และบทคัดย่อผลการวิจัยภายใน 30 วัน เมื่อโครงการวิจัยเสร็จสิ้น สำหรับโครงการวิจัยที่เป็นวิทยานิพนธ์ให้ส่งบทคัดย่อผลการวิจัย ภายใน 30 วัน เมื่อโครงการวิจัยเสร็จสิ้น

APPENDIX G

Consent form

หนังสือแสดงความยินยอมเข้าร่วมการวิจัย

ทำที่.....

วันที่.....เดือน.....

พ.ศ. .....

เลขที่ ประชากรตัวอย่างหรือผู้มีส่วนร่วมในการวิจัย…….....……

ข้าพเจ้า ซึ่งได้ลงนามท้ายหนังสือนี้ ขอแสดงความยินยอมเข้าร่วมโครงการวิจัย ชื่อโครงการวิจัย คุณภาพชีวิต และปัจจัยที่เกี่ยวข้องกับอาการปวดเท้าในกลุ่มวัยก่อนเกษียณอายุของจุฬาลงกรณ์มหาวิทยาลัย ประเทศไทย

ชื่อผู้วิจัย นางสาวภาวิณี หฤทัยชื่น

ที่อยู่ที่ติดต่อ วิทยาลัยวิทยาศาสตร์สาธารณสุข อาคารสถาบัน 3 ชั้น 10 จุฬาลงกรณ์มหาวิทยาลัย

โทรศัพท์เคลื่อนที่ 084-551-0444

E-mail: pavinee.h24@gmail.com

ข้าพเจ้า **ได้รับทราบ**รายละเอียดเกี่ยวกับที่มาและวัตถุประสงค์ในการทำวิจัย รายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ความเสี่ยง/อันตราย และประโยชน์ซึ่งจะเกิดขึ้นจากการวิจัยเรื่องนี้ โดยได้อ่านรายละเอียดในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด และ**ได้รับคำอธิบาย**จากผู้วิจัย **จนเข้าใจเป็นอย่างดี**แล้ว

ข้าพเจ้าจึง**สมัครใจ**เข้าร่วมในโครงการวิจัยนี้ ตามที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย โดยข้าพเจ้ายินยอมตอบแบบสอบถาม และ/หรือ รับการตรวจประเมินสุขภาพเท้าทางกายภาพบำบัด ซึ่งใช้เวลาประมาณ 30 นาที ประกอบด้วย

- *การประเมินโครงสร้างของนิ้วเท้า*
- *การประเมินโครงสร้างของข้อเท้า*
- *การประเมินรูปแบบอุ้งเท้า*
- *การประเมินความแข็งแรงของกล้ามเนื้อข้อเท้าและนิ้วเท้า*
- *การประเมินความยาวขา*

ข้าพเจ้ามีสิทธิ**ถอนตัว**ออกจากการวิจัยเมื่อใดก็ได้ตามความประสงค์ **โดยไม่ต้องแจ้งเหตุผล** ซึ่งการถอนตัวออกจากการวิจัยนั้น จะไม่มีผลกระทบในทางใดๆ ต่อข้าพเจ้าทั้งสิ้น

ข้าพเจ้าได้รับคำรับรองว่า ผู้วิจัยจะปฏิบัติต่อข้าพเจ้าตามข้อมูลที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และข้อมูลใดๆ ที่เกี่ยวข้องกับข้าพเจ้า ผู้วิจัยจะ**เก็บรักษาเป็นความลับ** โดยจะนำเสนอข้อมูลการวิจัยเป็นภาพรวมเท่านั้น ไม่มีข้อมูลใดในการรายงานที่จะนำไปสู่การระบุตัวข้าพเจ้า

หากข้าพเจ้าไม่ได้รับการปฏิบัติตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าสามารถร้องเรียนได้ที่คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ชั้น 4 อาคารสถาบัน 2 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330 โทรศัพท์ 0-2218-8147 โทรสาร 0-2218-8147 **E-mail: eccu@chula.ac.th**

ข้าพเจ้าได้ลงลายมือชื่อไว้เป็นสำคัญต่อหน้าพยาน ทั้งนี้ข้าพเจ้าได้รับสำเนาเอกสารชี้แจงผู้เข้าร่วมการวิจัย และสำเนาหนังสือแสดงความยินยอมไว้แล้ว

ลงชื่อ.....	ลงชื่อ.....
(นางสาวภาวิณี หฤทัยชื่น)	(.....)
ผู้วิจัยหลัก	ผู้มีส่วนร่วมในการวิจัย
ลงชื่อ.....	ลงชื่อ.....
(ผศ.ดร. รัตนา สำโรงทอง)	(.....)
อาจารย์ที่ปรึกษาวิทยานิพนธ์	พยาน

APPENDIX H

Testing of Research inspection tools

1. The content validity of Screening and Self-reported questionnaire

The test content and objectives are measured by Index of item-Objective Congruence (IOC) following by calculation from the formula:

$$\text{IOC} = \sum \frac{R}{N}$$

$\sum R$ = Sum scores of all experts

N = Numbers of experts

From the calculation of IOC to measure the content validity of screening and self-reported questionnaire, the results from the calculation are IOC = 1.00 and IOC = 0.79, respectively. The tests due to their congruence between the test and objectives or content are acceptable because IOC are higer than 0.5. As seen in Table 6 and Table 7, the researcher corrects 11 items in each part of the questionnaire which are composed of item 4 (the average sleeping duration), item 5 (falling history during the last 12 month), item 6 (current job), item 8 (the average working duration), item 9.5 (stair climbing at least 20 steps), item 10 (the average walking duration, the average sitting duration, the average standing duration), item 11 (time break during working), item 17.1 (appropriate foot size), and item 17.2 (soft insole).

2. The Test-Retest reliability

Kappa coefficient and Intraclass correlation coefficient (ICC) are used to report the levels of reliability for nominal data and continuous data, respectively. In case of ordinal data, the reliability levels are presented by kappa coefficient with linear weighting.

Considering kappa coefficient, the levels of reliability are divided into 5 levels consisting of very good agreement (kappa 0.81-1.00), good agreement (kappa 0.61-0.80), moderate agreement (kappa 0.41-0.60), fair agreement (kappa 0.21-0.40), and poor agreement (kappa less than 0.21) (Landis and Koch, 1977).

Regarding intraclass correlation coefficient, the levels of reliability are divided into 4 levels consisting of high reliability (ICC 0.81-1.00), moderate reliability (ICC 0.51-0.80), low reliability (ICC 0.21-0.50), and very low reliability (ICC less than 0.21) (Bowling 2002).

Table 5 The coefficient level and IOC from the reliability and the content validity test of Screening questionnaire.

Questions	Type of Data	Coefficient Level	Result	IOC
1. Working experience more than 1 year at Chulalongkorn University	Nominal	1.000	Very good	1.0
2. No medical conditions	Nominal	0.865	Very good	1.0
3. Currently foot pain from the accident (i.e. ankle sprain, open wound at ankle or foot etc.) for the last 1 month	Nominal	0.713	Good	1.0
4. History of foot operation	Nominal	1.000	Very good	1.0
5. History of foot fracture	Nominal	0.716	Good	1.0
6. Congenital spine abnormality	Nominal	1.000	Very good	1.0
7. Foot osteoarthritis	Nominal	1.000	Very good	1.0
8. Rheumatoid arthritis	Nominal	-	-	1.0
9. Systemic Lupus Erythematosus (SLE)	Nominal	-	-	1.0
10. Osteoporosis	Nominal	1.000	Very good	1.0
11. Gout	Nominal	1.000	Very good	1.0
12. Diabetes mellitus	Nominal	1.000	Very good	1.0
13. Neurological diseases (i.e. stroke, Parkinson’s disease)	Nominal	-	-	1.0

Table 6 The coefficient level and IOC from the reliability and the content validity test of Self-reported questionnaire.

Questions	Type of Data	Coefficient Level	Result	IOC
1. Gender	Nominal	1.000	Very good	1.0
2. Marital Status	Nominal	1.000	Very good	0.7
3. Education Level	Nominal	1.000	Very good	0.7
4. Average sleeping duration	Continuous	0.961	High	0.7
5. Falling history	Nominal	0.919	Very good	0.7
6. Current Job	Nominal	1.000	Very good	1.0
7. Working Experience at Chulalongkorn University	Continuous	0.765	Moderate	1.0
8. Working duration	Continuous	0.907	High	0.7
9. General working postures ..... Prolong sitting more than 2 hours	Nominal	0.919	Very good	1.0
..... Prolong standing more than 2 hours	Nominal	0.669	Good	1.0
..... Walking for long distance	Nominal	0.665	Good	1.0
..... Lifting more than 5 kg	Nominal	1.000	Very good	1.0
..... Stair Climbing	Nominal	0.864	Very good	0.3
10. Average working duration in these postures; ..... Walking	Continuous	0.707	Moderate	0.7
..... Sitting	Continuous	0.819	High	0.7
..... Standing	Continuous	0.850	High	0.7
11. Time break during working	Nominal	0.805	Very good	1.0
12. Working environment ..... Without loud voice disturbing	Nominal	0.719	Good	0.7
..... Appropriate temperature	Nominal	0.705	Good	0.7
..... Enough lighting	Nominal	1.000	Very good	0.7
..... Good air ventilation	Nominal	0.859	Very good	0.7
13. Leisure physical activity	Nominal	0.824	Very good	1.0
14. Types of exercise	Nominal	0.807	Very good	1.0
15. Smoking history	Nominal	1.000	Very good	1.0
16. General foot care ..... General self-foot assessment	Nominal	0.798	Good	1.0

Questions	Type of Data	Coefficient Level	Result	IOC
..... Foot skin moisture	Nominal	0.934	Very good	1.0
..... Foot soaking	Nominal	0.716	Good	1.0
..... Nail cut straight	Nominal	0.640	Good	1.0
..... Foot massage	Nominal	0.737	Good	1.0
..... Foot or calf stocking	Nominal	0.793	Good	1.0
..... Foot exercise	Nominal	0.851	Very good	1.0
17. General footwear ..... Appropriate foot size	Nominal	0.828	Very good	1.0
..... Soft insole	Nominal	0.870	Very good	0.7
..... Heel counter softness	Nominal	0.796	Good	1.0
..... Adjustable fixation	Nominal	0.611	Good	1.0
..... Heel height	Nominal	0.755	Good	1.0
..... Sole flexion point	Nominal	0.757	Good	0.7
18. SF-12 PCS	Continuous	0.989	High	-
19. SF-12 MCS	Continuous	0.987	High	-
20. History of MSDs during the last 12 months at these areas: ..... Low back pain	Nominal	0.933	Very good	-
..... Hip/Thigh pain	Nominal	0.931	Very good	-
..... Knee pain	Nominal	1.000	Very good	-
21. Current foot pain	Nominal	1.000	Very good	-
22. The sides of foot pain	Nominal	0.817	Very good	-
23. MFPDI score	Continuous	0.932	High	-

a. The reliability of Screening and Self-reported questionnaire

According to the Table 6 and Table 7, the coefficients have the range from 0.713 to 1.000 for the screening questionnaire and the range from 0.611 to 1.000 for the self-reported questionnaire. For the self-reported questionnaire, the lower accepatable levels of reliability (coefficient less than 0.61) were found in 2 items i.e. the self-reported callus formation at foot region and the foot orthotics use; therefore the researcher removed them from the self-report questionnaire.

b. The Intrarater reliability of Physical examination

According to the Table 8, the coefficient has the range from 0.713 to 1.000 for the physical examination test. All items reach the accepatable level of reliability with coefficient more than 0.60.

Table 7 The coefficient level from the reliability test of Physical examination.

Test	Types of Data	Coefficient Level	Result
1. Body mass index (BMI)	Continuous	0.945	High
2. Waist hip ratio (WHR)	Continuous	0.970	High
3. Callus formation …... Lt. Big toe	Nominal	0.839	Very good
…... Lt. Toes	Nominal	0.651	Good
…... Lt. Forefoot	Nominal	0.850	Very good
…... Lt. Mid foot	Nominal	-	-
…... Lt. Hind foot	Nominal	0.870	Very good
…... Rt. Big toe	Nominal	1.000	Very good
…... Rt. Toes	Nominal	1.000	Very good
…... Rt. Forefoot	Nominal	0.923	Very good
…... Rt. Mid foot	Nominal	-	-
…... Lt. Hind foot	Nominal	0.651	Good
4. Lt. Lesser toe deformities	Nominal	1.000	Very good
5. Rt. Lesser toe deformities	Ordinal	1.000	Very good
6. Lt. Hallux valgus	Ordinal	0.867	Very good
7. Rt. Hallux valgus	Nominal	0.701	Good
8. Lt. Foot Posture index	Nominal	0.875	Very good
9. Rt. Foot Posture index	Nominal	0.704	Good
10. Lt. Arch type	Nominal	0.857	Very good
11. Rt. Arch type	Nominal	0.725	Good
12. Lt. PGT1	Nominal	0.783	Good
13. Lt. PGT2	Ordinal	0.815	Very good
14. Lt. Ankle plantarflexor strength	Ordinal	0.931	Very good
15. Lt. Ankle dorsiflexor strength	Nominal	0.850	Very good
16. Rt. PGT1	Nominal	1.000	Very good
17. Rt. PGT2	Ordinal	0.902	Very good
18. Rt. Ankle plantarflexor strength	Ordinal	0.825	Very good
19. Rt. Ankle dorsiflexor strength	Nominal	0.866	Very good
20. Leg length measurement	Nominal	1.000	Very good

Certification of Research Inspection Tools

After an inspection for suitability of the screening test and questionnaire of Miss Pavinee Harutaichun, Student ID No. 5578810853, Master of Public Health, College of Public Health Sciences, Chulalongkorn University.

I, hereby, certified that the screening test and questionnaire have content validity that are suitable for the topic on "Quality of life and factors associated with foot pain in pre-retirement aged at Chulalongkorn University, Thailand".

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20/11/2012

(Assist.Prof. Ratana Samrongtong, Ph.D.)

Specialist in Aging and Public health

College of Public Health Sciences, Chulalongkorn University

Certification of Research Inspection Tools

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Praneet Pensri

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(Assist.Prof. Praneet Pensri, Ph.D.)

Specialist in Foot health in elderly persons, children and athletes

Department of Physical Therapy, Chulalongkorn University

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BIOGRAPHY

Miss Pavinee Harutaichun was born on July 24, 1987 in Bangkok, Thailand. She graduated a Bachelor's degree (second class honour) in Physical Therapy from the Faculty of Allied Health Sciences, Chulalongkorn University, in 2009. Since she graduated, she had worked as an assistant researcher in Department of Physical Therapy, Faculty of Allied Health Sciences, Chulalongkorn University until 2010. Then, she has worked as a physical therapist at Health Sciences Service Unit (HSSU), Faculty of Allied Health Sciences, Chulalongkorn University. She interests in foot health and musculoskeletal disorders in elderly persons. She had experience from the training at foot care clinic of Ratprachasamasai Institute, Department of Disease control, Ministry of Public Heath during October and December 2011. In June 2012, she enrolled in a Master degree of Public Health at College of Public Health Sciences, Chulalongkorn University.