PREVALENCE AND RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDER IN MAINTENANCE INDUSTRY WORKERS: A CASE STUDY OF LIGNITE POWER PLANT IN LAMPANG PROVINCE THAILAND

Miss Chatsuda Mata

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University
บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)
เป็นแฟ้มข้อมูลของนิสิตเจ้าของวิทยานิพนธ์ที่ส่งผ่านทางบัณฑิตวิทยาลัย
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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Public Health Program in Public Health
College of Public Health Sciences
Chulalongkorn University
Academic Year 2014

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ความชุกและปัจจัยเสี่ยงที่เกี่ยวข้องกับความผิดปกติของกล้ามเนื้อและโครงกระดูกในช่างซ่อมบำรุง โรงงานอุตสาหกรรม : กรณีศึกษาโรงไฟฟ้าถ่านหินลิกไนต์ จังหวัดลำปาง ประเทศไทย

นางสาวฉัตรสุดา มาทา

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2557
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Thesis Title	PREVALENCE AND RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDER IN MAINTENANCE INDUSTRY WORKERS: A CASE STUDY OF LIGNITE POWER PLANT IN LAMPANG PROVINCE THAILAND
By	Miss Chatsuda Mata
Field of Study	Public Health
Thesis Advisor	Professor Surasak Taneepanichskul, M.D.
Thesis Co-Advisor	Nutta Taneepanichskul, Ph.D.

Accepted by the Faculty of College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the College of Public Health Sciences
(Associate Professor Sathirakorn Pongpanich, Ph.D.)

THESIS COMMITTEE

.....Chairman
(Associate Professor Ratana Somrongthong, Ph.D.)
.....Thesis Advisor
(Professor Surasak Taneepanichskul, M.D.)
.....Thesis Co-Advisor
(Nutta Taneepanichskul, Ph.D.)
.....Examiner
(Associate Professor Wattasit Siriwong, Ph.D.)
.....External Examiner
(Anuchart Kaunnil, Ph.D.)

ฉัตรสุดา มาทา : ความชุกและปัจจัยเสี่ยงที่เกี่ยวข้องกับความผิดปกติของกล้ามเนื้อและโครงกระดูกในช่างซ่อมบำรุงโรงงานอุตสาหกรรม : กรณีศึกษาโรงไฟฟ้าถ่านหินลิกไนต์จังหวัดลำปาง ประเทศไทย (PREVALENCE AND RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDER IN MAINTENANCE INDUSTRY WORKERS: A CASE STUDY OF LIGNITE POWER PLANT IN LAMPANG PROVINCE THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศ. นพ. สุรศักดิ์ ฐานีพานิชสกุล, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ดร. ณัฏฐา ฐานีพานิชสกุล, 113 หน้า.

การศึกษานี้มีจุดประสงค์เพื่อหาความชุกและปัจจัยเสี่ยงที่เกี่ยวข้องกับความผิดปกติของกล้ามเนื้อและโครงกระดูก ในงานซ่อมบำรุงที่โรงไฟฟ้าฝ่ายผลิตแห่งประเทศไทย จังหวัดลำปาง การศึกษานี้เป็นแบบภาคตัดขวาง ประชากรที่สำรวจมีจำนวนทั้งสิ้น 317 คน โดยใช้แบบสอบถามในการเก็บข้อมูล ซึ่งประกอบด้วยลักษณะส่วนบุคคล, ลักษณะของงาน, ลักษณะท่าทางการทำงาน, สภาวะทางจิตสังคมในการทำงานรวมถึง แบบสอบถามาตรฐานเกี่ยวกับการประเมินความผิดปกติทางระบบกล้ามเนื้อและโครงกระดูก (NMQ) ซึ่งวิเคราะห์ความสัมพันธ์ทางสถิติด้วยไค-สแควร์ (Chi-square Test) และ Odd ratio เพื่อดูความเสี่ยงของแต่ละปัจจัย ผลการศึกษาพบว่าในระยะ 1 ปีที่ผ่านมาพบผู้มีอาการเบื้องต้นของโรคความผิดปกติของกล้ามเนื้อและโครงกระดูกจำนวน 66.4 % ของช่างซ่อมบำรุงทั้งหมด และในระยะ 7 วันที่ผ่านมามีจำนวน 57.7 % ของช่างซ่อมบำรุงพบอาการข้างต้นมีความสัมพันธ์ต่อปัจจัยส่วนบุคคลในด้านระดับการศึกษา ($p = 0.01$), ปัญหาทางสุขภาพ ($p = 0.03$), ปัจจัยของงานในด้านลักษณะสถานที่ทำงาน ($p = 0.01$), และการทำงานนอกเวลา ($p = 0.01$) ในส่วนของลักษณะท่าทางการทำงานพบว่า ท่าก้มตัว ($p = 0.02$), ท่านอน ($p = 0.01$), ท่ายืน ($p = 0.02$), ท่ายกของ ($p = 0.01$) มีผลต่ออาการเจ็บปวดของกล้ามเนื้อ และยังพบว่าในด้านของจิตสังคมหัวข้อ การเปลี่ยนงาน ($p = 0.02$) มีผลต่อการมีอาการดังกล่าวด้วย ซึ่งทั้งนี้จะเห็นว่า มีผู้ที่มีอาการเบื้องต้นของความผิดปกติของกล้ามเนื้อ และโครงกระดูกจำนวนมากในช่างซ่อมบำรุง จึงควรที่จะมีการจัดสิ่งแวดล้อมในที่ทำงาน และ มีการอบรมของการป้องกันเพื่อไม่ให้เกิดอาการเจ็บปวดขึ้น

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2557 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

5778805953 : MAJOR PUBLIC HEALTH
KEYWORDS: MUSCULOSKELETAL DISEASE / WORK-RELATED INJURY / PREVLENCE OF MSD / RISK FACTOR OF MSD / MAINTENACE WORKER

CHATSUDA MATA: PREVALENCE AND RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDER IN MAINTENANCE INDUSTRY WORKERS: A CASE STUDY OF LIGNITE POWER PLANT IN LAMPANG PROVINCE THAILAND. ADVISOR: PROF. SURASAK TANEEPANICHSKUL, M.D., CO-ADVISOR: NUTTA TANEEPANICHSKUL, Ph.D., 113 pp.

The purpose of this study is to find out the prevalence of musculoskeletal disease among maintenance worker of lignite power plant in Lampang Province, Thailand and to determine the risk factors that associated with MSDs. A cross-sectional study conducted with structured face-to-face interview questionnaire among 317 workers working in maintenance at least 6 months. The prevalence rates of MSDs based on the Nordic Standard Form. Chi-square analysis were used to analyze association between independent and dependent variables with statistical significant of $p < 0.05$ and odds ratio with 95% CI was applied to explore the risk factors of MSDs. All of the participating workers, 66.4 % reported MSDs in part 12 months and 57.7 % in past 7 days. Association was found between education level ($p = 0.01$), health problems ($p = 0.03$), work areas ($p = 0.01$), and over time ($p = 0.01$). Postures of trunk slightly flexion ($p = 0.02$), prone ($p = 0.01$), stand ($p = 0.02$), lifted/carried with bend down trunk in light weight ($p = 0.034$), lifted/carried with bend down trunk in medium weight ($p = 0.01$) and lifted/carried with upright trunk in light weight ($p = 0.03$) were significantly with MSDs in past 12 months. Psychosocial exposure result showed the significant difference in changing workplace with MSDs in past 7 days ($p = 0.02$). The high prevalence of musculoskeletal disorder among maintenance workers and exposure to ergonomics factors were found significantly associated to health hazard. Suggestions for appropriated ergonomics design and ergonomics training are required for the maintenance workers.

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

Academic Year: 2014 Advisor's Signature .....

Co-Advisor's Signature .....

ACKNOWLEDGEMENTS

This thesis cloud not been complete that presented from without the supporting from several of people who contributed their efforts to my study.

Foremost, I would like to express my sincere gratitude to my advisor Prof. Surasak Taneepanichskul for his patience, motivation, enthusiasm, and immense knowledge. Besides my advisor, I would like to thank to my co-advisor Dr. Nutta Taneepanichshul for her encouragement, insightful comments. Her guidance helped me in all the time of research and writing of this thesis.

I place on record, my sincere thanks to Assoc. Prof. Dr. Sathirakorn Pongpanich, Dean of the faculty for continuous encouragement.

I would like to thank the rest of my thesis committee: Assoc. Prof. Dr. Ratana Somrongthong, Assoc. Prof. Dr. Wattasit Siriwong and Dr. Anuchart Kaunnil for their reinforcement and variable comments.

I wish to express thank to college of public health, Chulalongkorn university, for providing me with all necessary.

The special thanks would also being addressed to all the participants who are maintenance workers in EGAT, Lampang provience for their time and thoughtful response.

I am also grateful, my sense of gratitude to one and all who directly or indirectly, have gave their hand in my venture.

Last but not the least, I would like to thank my parents for giving birth to me at the first place and supporting me spiritually throughout my life.

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CHAPTER I
INTRODUCTION

1.1 Background and Rationale

Occupation health disease and work-related injuries have been increased in employees, employers and governmental working units. These increase of diseases put a big impact on worker's health and productivity. In previous 12 months, the workers in Australia were found 10.8 million cases with work-related injury or illness (WenZhou Yu, 2012). More than 600,000 workers in the US, have work-related musculoskeletal disorder in every years. The leading hazardous agent was the musculoskeletal disorder (David, 2005). It is the related illness and the common worker's health problems and the largest disease in work major is caused of occupational disease. The World Health Organization (WHO, 2007) disclosed the influence of work-related musculoskeletal diseases(WMSD) that was multifactorial, and showed a number of risk factors contributed and intervention plan. In Thailand prevalence of MSDs presented in the top 5 diseases of all patient (Suda Hanklang, 2012). In 1995, the cost of WMSD in US was 215 billion dollars and 26 billion dollars in Canada (Coyte, 1998). It's is the most expensive of work related illness. Iranian welders in factory had the high prevalence in musculoskeletal symptoms (88.3%). The highest MSDs was found in pain of wrist, lower back, neck and knee(Ebrahimi Hossein1, 2011).

Maintenance workers are conducted in all sectors such as protecting in failure, managerial actions during the life cycle of the item, testing, or restore. The tasks of maintenance are not exclusive, therefore workers can expose to wide variety of hazards. Musculoskeletal disorder is one of the high risk, through carried load, working in awkward postures and unappropriated environment condition(OSHA, 2010). In this study is interested in maintenance workers specific in welder and turner. From Europe study found 15-20% of injuries at work happen during welder and turner (TUC, 2010). Nordic standard musculoskelatal questionnaire can use for assessment in history of MSDs in part 7 days and 12 months in nine body region; neck, wrist, elbow, shoulder, hip, lower back, upper back, knee and ankle (Kuorinka, 1987).

Electricity Generating Authority of Thailand (EGAT), Lampang province or Mae Moh powerplant. This power plant is the biggest lignite power plant in Thailand, contains of 13 generators with the total generating capacity of 2,625 MW (EGAT, 2015). It also had many workers to support in this area.

The risk factors that significantly associated with MSDs were individuals, the work experience as welder or other position in maintenance workers, physical factors and psychosocial factors are also known to be important predictive variables (Bruce P. Bernard, 1997).

Therefore, this study aim to find out the prevalence in 317 maintenance workers in lignite power plant, Lampang province, Thailand and find the associated risk factors that develop MSDs.

1.2 Research question

1. What is prevalence of musculoskeletal disorder symptoms among maintenance industry workers of lignite power plant in past 12 months and 7 days?

2. What are risk factors associated with musculoskeletal disorder symptoms among maintenance industry workers of lignite power plant?

1.3 Objectives of this study

1. To find prevalence of musculoskeletal disorder symptoms among maintenance industry workers in lignite power plant under Electricity Generating Authority of Thailand (EGAT), Lampang in past 12 months and 7 days.

2. To explore the risk factors that related to musculoskeletal disorder symptoms in these workers.

1.4 Hypothesis

1. Personal characteristics of the maintenance industry workers of lignite power plant associated with musculoskeletal disorder symptoms.

2. Job characteristics of maintenance workers in lignite power plant associated with musculoskeletal disorder symptoms.

3. Physical work factors of maintenance workers in lignite power plant associated with musculoskeletal disorder symptoms.

1.5 Scope of study

1. Questionnaires was face to face interview from maintenance industry workers in EGAT, Lampang.

2. The risk factors composed of personal factors, job characteristic factors and work environment that causes of musculoskeletal disorder among maintenance industry workers will be identified.

3. The period of data collection was on April 2015.

1.6 Limitation of this study

The questionnaire couldn't identified the degree of work postural such as trunk slightly flexion, lateral bend and twist.

1.7 Benefit of this study

This study can be the database of prevalence in musculoskeletal disorder among maintenance worker in Thailand. And the finding is a mouth of the workers.

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1.8 Conceptual Framework

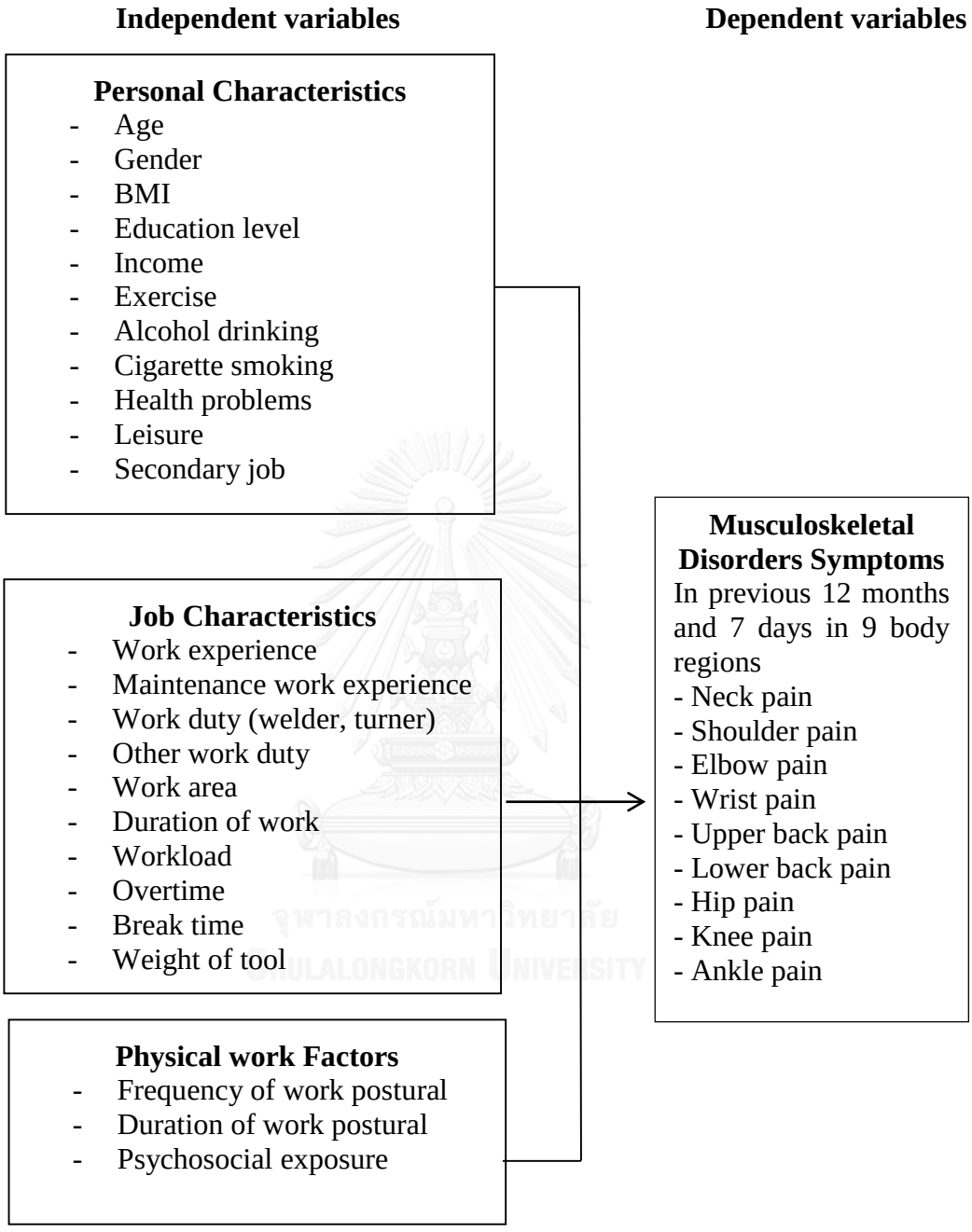

Figure 1 Conceptual Framework

1.9 Operational Definitions

Maintenance workers refer to the worker who worked as the welder or turner position.

Musculoskeletal disorder refers to an injury of the musculoskeletal system caused from repeated exposure to risk factors in the workplace, in upper and lower part by use Nordic Musculoskeletal Questionnaire (Ontario, 2007).

Personal characteristics refer to unique characteristics or the description in each person including age, gender, BMI, education level, income, exercise, alcohol drinking, cigarette smoking, health problems, leisure, and second job. (Polruk, 2013)

BMI refers to Body Mass Index. It can be calculated with weight in kilograms divided by the square of height in meters (kg/m^2)

Income refers to the salary that maintenance worker get in each month.

Education level refers to the highest education of maintenance worker.

Exercise refers to physical activity as any body movement produced by skeletal muscles that requires energy expenditure at least 30 minutes (WHO, 2015)

Health problems refer to disease of workers had before study, do not need diagnosis from physician.

Leisure refers to the activities for relaxing without business work and excepts the essential activities such as sleeping and eating.

Second job refers to the alternative income that exclude maintenance work in this lignite power plant.

Job characteristics refer to characteristics of work, including work experience, maintenance, work experience, work position, other work position, work area, duration of work, workload, overtime, break time, weight of tools (Polruk, 2013).

Work experience refers to the duration of started work until now in this lignite power plant.

Maintenance work experience refers to the duration of started work in maintenance worker position until now in this lignite power plant.

Work duty refers to the responsibility of maintenance worker including welder and turner.

Welder refer to the maintenance worker who fix the pipe by welding.

Turner refer to the maintenance worker who compound the pipe.

Other work duty refers to every work positions excluded maintenance work positon.

Work area refers to the work station when maintenance worker worked including ground, height area, narrow space and confine space.

Duration of work refers to the time that worker spent in their maintenance work.

Workload refers to the number of maintenance work in one day.

Overtime refers to the duration of worker do after 4 PM (office's time) in each month.

Break time refers the duration of stop working for rest during one work session (minutes/session).

Weight of tools refers to the weight of maintenance tools that worker carried in their work.

Light weight refers to the weight less than 2 kilograms.

Medium weight refers to the weight 2 -5 kilograms.

Heavy weight refers to the weight more than 5 kilograms.

Physical factors refer to frequency of work postural and duration of work postural.

Frequency of work postural refers to the rate of recurrence in work postural; trunk, arm, wrist/hand, legs and the trunk posture with carried the tool.

Duration of work postural refers to how long that worker do in each postural; trunk, arm, wrist/hand, legs and the trunk posture with carried the tool.

Psychosocial exposure refers to the psychology and social effect that can cause of the stress in workplace.

CHAPTER II
LITERATURE REVIEW

2.1 Work - Related Musculoskeletal Disorder

Musculoskeletal disorder is a replication of muscle, tendon, blood vessel, nerve and join in the body. In the workstation, you may get the risk exposure from physical factor, job tasks with limited motion and repetitive work called WMSDs; it also causes pain in all tendon sheaths, ligaments, bursa and intervertebral discs, etc. (Australian safety, 2006). Other symptoms are swelling, stiffness or inability to work. (Villa-Forte, 2015).The level of pain can be separated into two stages, from acute to chronic disease depending on how much of risk exposure(Jo Nijs, 2009).

2.2 The most common WMSDs and structures affected

Tendonitis

The tendons are fibrous and flexible bands of tissue. Muscles and bones are connected by tendons that provides the support to body movement and functions. When tendons re overused by repeated tasks or overloaded activities such as handing load, it can causes tendons to suffer from microscopic tears, inflammation or irritation. These condition are called tendonitis. The most common body region of tendonitis are elbow, wrist, shoulder, knee and ankle. For undefined reasons, tendonitis mostly occurs in diabetes people (Harvard, 2014).

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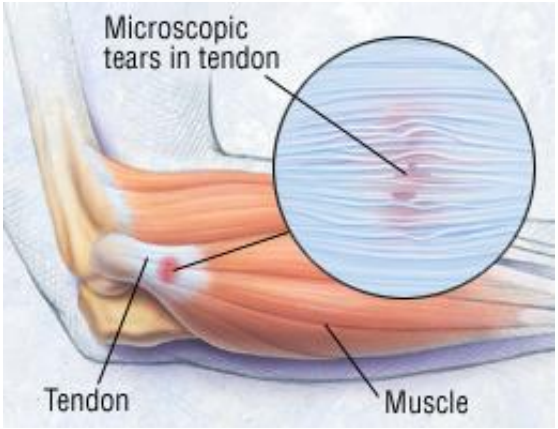

Figure 2 Microscopic tears in tendon (Harvard, 2014)

Tenosynovitis

Tenosynovitis is inflammation of the sheath that surrounding tendons. It can be caused by inflammation and non-infection factors, such as overuse or arthritis. Most acute cause of tenosynovitis is tendon flexion in the hand (Foster, 2013). For example, Dev Quervain Tendinosis, is a painful inflammation in extend the thumb (Georgia, 2012).

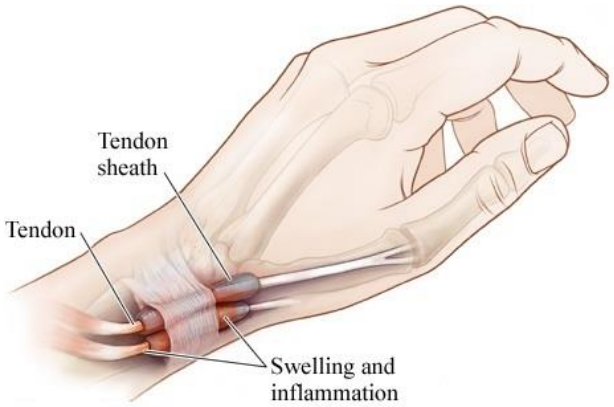

Figure 3 Dev Quervain Tendinosis (Georgia, 2012)

Bursitis

Bursa is a lubrication fluid sac in tissues such as muscle, tendons, muscle and skin. Bursa irritation or inflammation is called bursitis. It is commonly caused by repetitive movement or over use. Individual factors are age, tendons are able to tolerate stress less, are less elastic, and are easier to tear(Serge Sinoneau, 1996).

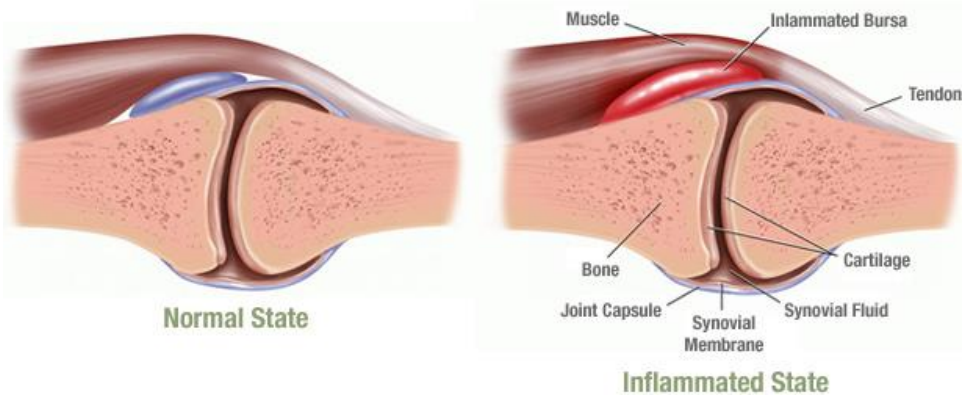

Figure 4 Bursitis - Bursae inflammation (Health, 2015)

Carpal tunnel syndrome (CTS)

Carpal tunnel is the compound of the carpal bones that form to the gravity where many tendons, nerves and blood vessels pass. Carpal tunnel syndrome is condition of the nerves compressed, and show swelling of tendons passing nearby, in a limited space that constitutes the carpal tunnel. It affects the median nerve, blood vessels and tendon. The affliction of the nerve leads to numbness/tingling affecting the thumb, index, middle, and half of the ring fingers, especially at night weak grip. The possible cause is the repetitive flexion of wrist (AAOS, 2009).

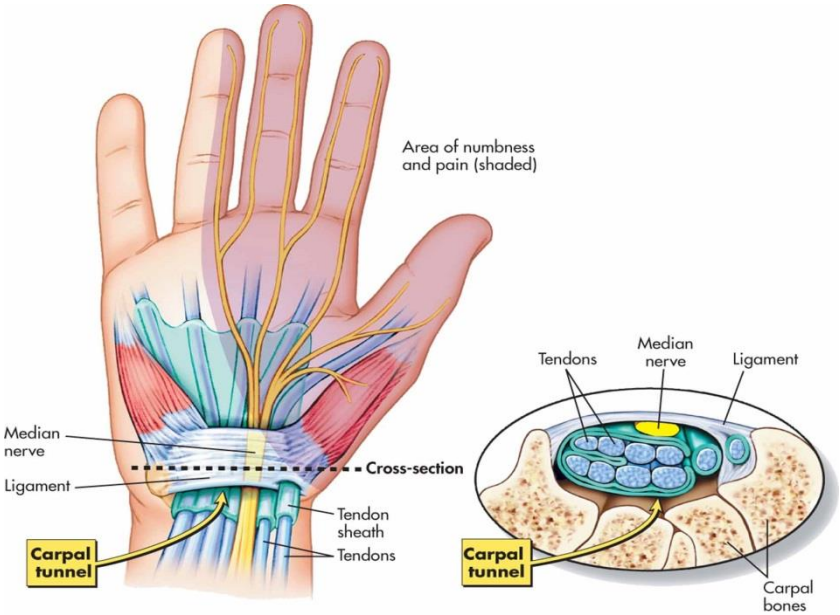

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Figure 5 Carpal tunnel (AAOS, 2009)

Table 1 Other cases of common WMSDs

DISEASE	TISSUE AFFECTED	SYMPTOM	POSSIBLE CAUSES
Myofascial pain in the neck and upper back	Muscles, Tendon, Sometimes nerves	Pain ,Stiffness in upper back and neck, Poor sleep	Working overhead arms in extended position
Rotator cuff tendonitis	Rotator cuff tendon located in front of shoulder	Shoulder pain, Stiffness, Problem reaching behind on upper back	Repeated shoulder movement especially with twisting Overhead
Tennis elbow (lateral epicondylitis)	Elbow tendon on thumb side of arm	Elbow pain problem, Wringing towel and Carrying groceries	Repeated twisting arm movement
Trigger fingers or tenosynovitis of fingers	Tendons, synovium	Fingers “lock”	Repeated use of hand tools or gripping motions
Wrist/forearm tendonitis	Tendons, Muscle	Pain, Swelling Weak grip	Repetitive movements of wrists and forearms

Source: Ontario university (Michael S. Kerr, 2001)

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2.3 Risk factors of musculoskeletal disorder symptoms

2.3.1 Personal Characteristics

In each person have the specific personal characteristics. Some of these characteristics can be risk factors in MSDs. These factors differ depending on the study but may include age, gender, BMI, smoking, physical activity, sport activities, alcohol/tobacco consumption, previous WMSDs, and degenerative joint diseases. (Isabel L. Nunes, 2011)

Age

The result from a larger agency study in young 100 workers that analyzed more in-depth the situation of workers age presented the young age group most exposed to MSDs risk factors with the exception of painful people. This risk is often linked to work sectors, occupations and types of company. National data presented data from Spain, indeed suggested that young workers might be highly exposed, as the number of occupational diseases of industry workers is increasing (Irastorza, 2010).

Gender

CTS is found commonly in women than men. Because of strong hormonal changes during pregnancy and menopause due to increased fluid retention and other physiological conditions that make them more likely to suffer from WMSD. Other reasons for the increased percent of WMSDs in women may be credited to differences in physical body such as, muscular strength, anthropometry, or hormonal issues. And the other cause of higher prevalence in women is the more women are employed in hand-intensive (Bruce P. Bernard, 1997). The risks of CTS increases for both men and women as they age after 55 year old.

Smoking

In the previous study, found a relationship between smoking and back pain only in those occupations that required physical exertion. Smoking was related to pain in the extremities than neck or the back. The prevalence of back pain increased with the number of pack-years of cigarette smoking. Coughing from smoking is also one hypothesis of back pain (J P Jansen, 2004).

2.3.2 Job Characteristics

Frequency

Frequency is the number of times that present a risk factor within a given time interval. For example, vibrations twice a day is a lower risk factor than being exposed hundred times per day (Serge Sinoneau, 1996).

Repetition

A task is repetitive when similar actions or movements are often done during a specific period of time. During repetitive tasks, the musculoskeletal system can begin to fatigue, if the amount of force applied may the same during the tasks, an MSD may occur is the musculoskeletal system is too fatigued to handle the stress (Ontario, 2007).

Work Force

Force is the handling of heavy objects. It is the amount of effort exerted by the muscles in order to complete a task. For example, when using manual tools, it is regularly necessary to make an effort, if only to support the tool. Some activities that can result in forces being applied include lifting, lowering, pushing, pulling, and carrying (Julitta Boschman, 2012).

Duration

Duration has several meanings. It can be the duration of the effort made within the cycle or the amount of time spent in a given posture within a work cycle, for example the elbow being flexion for 45 seconds in a two-minute cycle. The longer the time spent in the cycle, the higher the risk factor. Duration can also mean the number of hours in a work shift when a worker is exposed to a given risk. For example, doing repetitive work for 20 minutes does not have the same impact as when such work is done for the entire shift. Duration can also refer to a much broader scale. It this case, it may mean the number of years during which the worker has been exposed in their professional life (WenZhou Yu, 2012).

Posture

In the work place, inappropriate working posture can contribute increase risk in using uncomfortable or compensation postures of the workers. An awkward posture is any fixed or constrained body position that overloads muscles, tendons or joints. This posture is usually far from the limits of the joint's range of motion; it requires little effort to maintain and does not put the anatomical structures in an unfavorable position.(Michael S. Kerr, 2001) For example, the position where the arm is kept fully stretched in front of the body (shoulder flexion) is not extreme in that it is far from the limits of the joint's range of motion. If muscles are repeatedly placed in these positions or held for prolonged periods of time they begin to fatigue and surrounding tissues become stressed, making them more susceptible to an MSD.

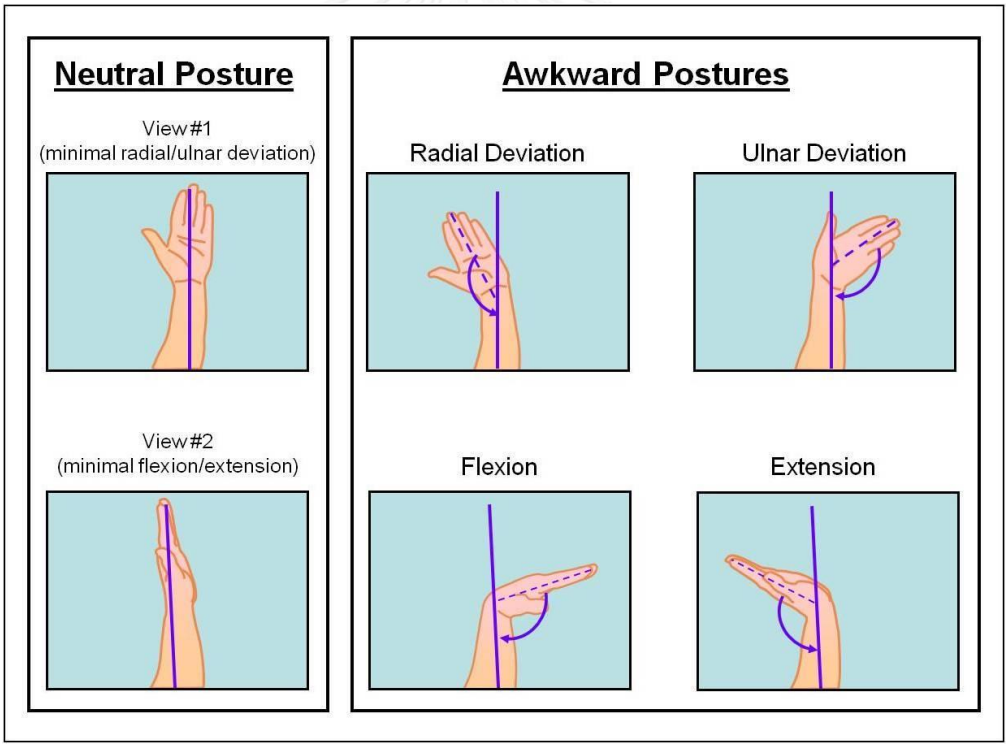

Figure 6 Neutral and awkward wrist postures (Middlesworth, 2015)

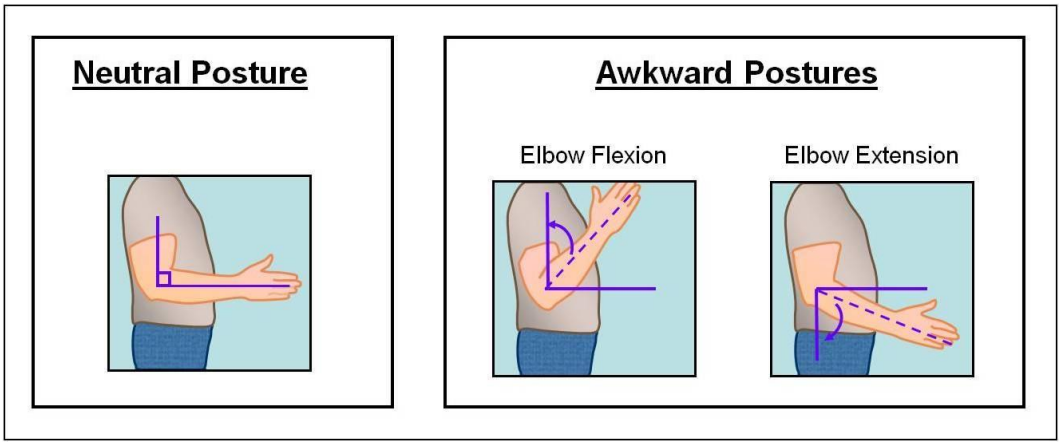

Figure 7 Neutral and awkward elbow postures (Middlesworth, 2015)

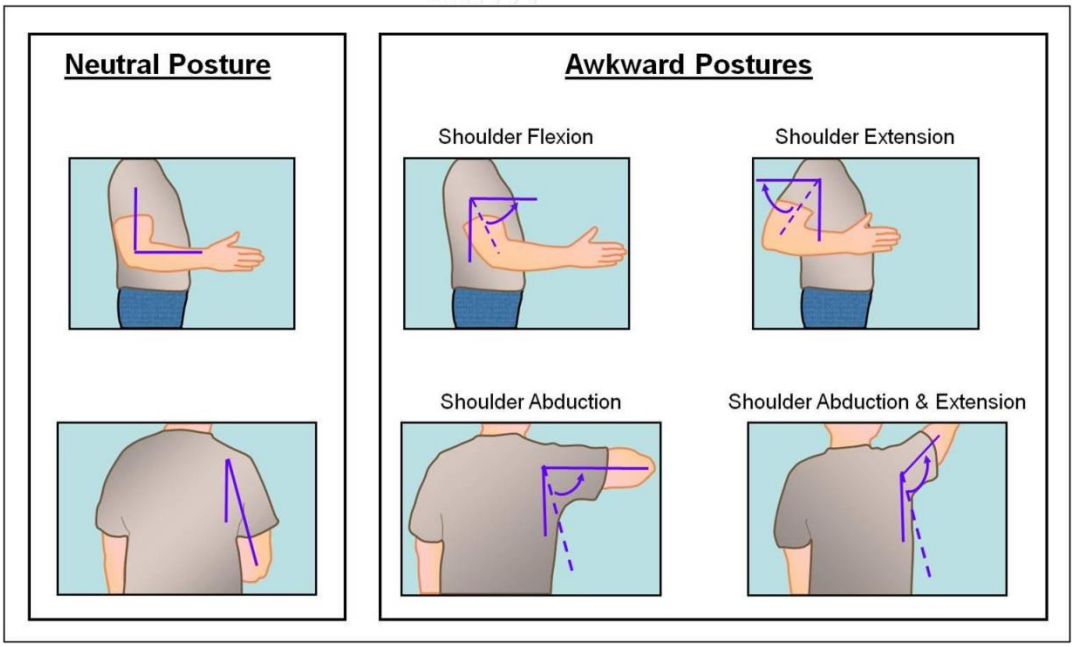

Figure 8 Neutral and awkward shoulder postures (Middlesworth, 2015)

The work posture adopted depends on the environment of workplace. Workers may sometimes adopt extreme postures because the material is poorly located, or because the work surface is not adequate.

Vibrations

When handling electric or pneumatic tools, stronger the grip, that workers are exposed to the type of vibrations that constitute a WMSDs risk for the upper limbs. Hand-arm vibration encountered through hand-held tools may lead to degenerative disorders or to blood circulation problems in the hand such as white fingers syndrome, neurological problems such as carpal tunnel syndrome, and joint disorders of the wrist, elbow and shoulder. Whole-body vibration in vehicles may lead to degenerative disorders, in particular, of the lumbar and thoracic spine (Serge Sinoneau, 1996).

Figure 9 Vibration handing (Serge Sinoneau, 1996)

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2.4 Management of musculoskeletal disorder

Medical interventions

Medical intervention is the goal to occupation related musculoskeletal by preparing clinical area and surgical operative surgical management. Harris investigated the outcomes for orthopedics surgery and compensation status in a meta-analysis. The 211 articles that met the inclusion criteria, 35 reported equivocal or no differences in outcome, one a favorable difference and 175 a worse outcome, with a summary odds ratio of 3.75 (Isabel L. Nunes, 2011).

Pharmacotherapy

The drug is paracetamol (acetaminophen), compounding opioid analgesics and NSAIDs. Many measures are available over the counter and are safe in prescribed doses, in the chronic use of NSAIDs is increasingly being recognized as a potential source of secondary morbidity. Most of the data indicates little advantage over paracetamol. The evidence base for many NSAIDs is potentially compromised by the high proportion of industry-sponsored trials. Compound opioid/paracetamol analgesics may offer a modest advantage over paracetamol, alone although evidence is sparse. (Isabel L. Nunes, 2011).

Workplace adjustments

From risk assessment and frequency of source of absence among workers. Supporting by rehabilitation, improve hazardous working situation and making working hours (Bevan, 2013).

2.5 Job maintenance plan of the EGAT, Lampang

In EGAT, Lampang has 10 power plants, including 4-13 units and maintenance department separate responsibility in 5 departments:

1. General maintenance department; responsibility in every unit when the unit shutdown
2. Power plant maintenance department 1; unit 4-7
3. Power plant maintenance department 2; unit 8-11
4. Power plant maintenance department 3; unit 12-13
5. Power plant maintenance department 4 ; unit 4-13

Work section

General maintenance is incorporating;

- Maintenance planning section
- Boiler maintenance section
- Turbine maintenance section
- Electrical maintenance section
- Instrument maintenance section
- Mechanical workshop section
- Electrical workshop section

Power plant maintenance department ; 4-13 units

- Fuel handing system mechanical maintenance section
- Ash handing system mechanical maintenance section
- Water treatment system mechanical maintenance section
- Electrical maintenance section
- Instrument maintenance section

2.6 Type of the maintenance worker

The maintenance workers are main two types of work, first is the welder and second is turner.

Welder

Welder is responsible for welding wire or materials together by melting the parts and then using a filler to form a joint.

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Figure 10 Welder is welding the pipe at Mae Moh powerplant

Turner

Turners are those who construct the material, such as a wire.

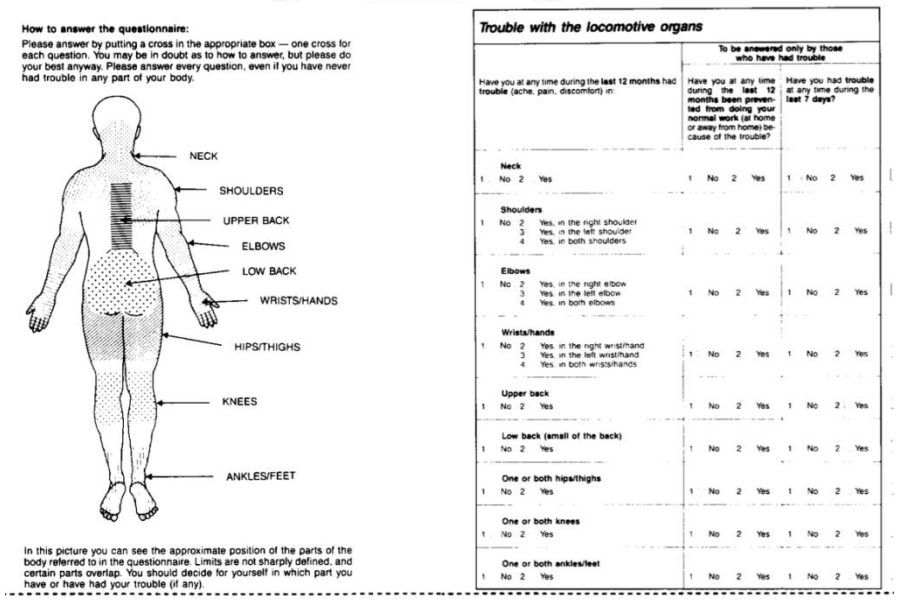
Figure 11 Turner is compound the pipe at Mae Moh powetplant

2.7 Nordic Musculoskeletal Questionnaire

The Nordic Musculoskeletal Questionnaire (NMQ) has been widely used to assess the nature and severity of self-rated musculoskeletal symptoms. The questionnaire includes items asking about the experience of musculo-skeletal problems in nine body areas (neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles/feet) over the past week and over the past year. Thus, weekly and annual prevalence of MSD can be derived (Kuorinka, 1987).

In addition, a second group of questions requests detailed information about MSD problems relating to three main body areas; neck, shoulders, and lower back. In these sections, the information obtained includes the total length of time during the past 12 months that the symptoms have been experienced, whether work or leisure activities have been reduced because of the problems, the total length of time that normal work has been prevented, and whether a medical practitioner or other healthcare professional had been consulted.

The Nordic MSQ was used to assess musculoskeletal problems in the present study. Other information obtained in this study included age, height and weight, mental health, and perceptions of the work environment.



How to answer the questionnaire:

Please answer by putting a cross in the appropriate box — one cross for each question. You may be in doubt as to how to answer, but please do your best anyway. Please answer every question, even if you have never had trouble in any part of your body.

In this picture you can see the approximate position of the parts of the body referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself in which part you have or have had your trouble (if any).

Trouble with the locomotive organs

Have you at any time during the **last 12 months** had **trouble** (ache, pain, discomfort) in:	To be answered only by those who have had trouble: Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	Have you had trouble at any time during the last 7 days?
Neck 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes
Shoulders 1 No 2 Yes, in the right shoulder 3 Yes, in the left shoulder 4 Yes, in both shoulders	1 No 2 Yes	1 No 2 Yes
Elbows 1 No 2 Yes, in the right elbow 3 Yes, in the left elbow 4 Yes, in both elbows	1 No 2 Yes	1 No 2 Yes
Wrists/hands 1 No 2 Yes, in the right wrist/hand 3 Yes, in the left wrist/hand 4 Yes, in both wrists/hands	1 No 2 Yes	1 No 2 Yes
Upper back 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes
Low back (small of the back) 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes
One or both hips/thighs 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes
One or both knees 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes
One or both ankles/feet 1 No 2 Yes	1 No 2 Yes	1 No 2 Yes

Figure 12 Nordic Musculoskeletal Questionnaire (Kuorinka, 1987)

2.8 Related article

In 2004**,** Ran Guo presented the prevalence of Musculoskeletal disorder among workers in Taiwan by non self-employed worker)22,475 person(showing that the response rate of 84.3 % and 37.0 % were found to have MSD. Within those, the female workers (39.5%) showed significant higher prevalence than male workers (35.2%(. For education and age displayed significant association with MSD)<0.001in both genders((How-Ran Guo, 2004).

According to Boschman et al.(2012) ;the study found that the risks of musculoskeletal disorder in back, knee, and shoulder or upper arm were the occupational physical tasks. And the intervention was related to workplace adaptation (Julitta Boschman, 2012)

Kaufman-Cohen and Ratzon, (2011) studied multivariate regression model. It showed the correlation between independent variable; biomechanical risk factors, perceived physical environment risk factors, instrument weight and average playing hours per week and the main predictors of MSDs (Ratzon, 2011).

Hanklang et al. (2012). The cross-sectional study estimated the prevalence and risk factors among Thai industry women workers. The prevalence of MSDs was 57.7%. The highest body region was low back pain and shoulder pain. MSDs was caused by ergonomic factors, such as workforce, repetitive worker in continuous back bending, and heavy workload. And the gender was the on risk because of the types of jobs they do (Suda Hanklang, 2012).

2.9 Framework Model for Musculoskeletal disorder

ICF model

ICF model (The International Classification of Functioning, Disability and Health) is the standard model for health and health-related disorder stated by WHO in 1980. It is the common model for measurement, definition and policy management for health and disability. Figure 13 shows the basis for ICF (WHO, 2002). Health condition and contextual factors are the income and disability is the outcome.

Health condition includes disease, disorder and injury.

Contextual factors include environmental factors (for example legal and social structure) and personal characteristics (for example age, gender, education level, past and current experience) (Richard Pew et al., 1999).

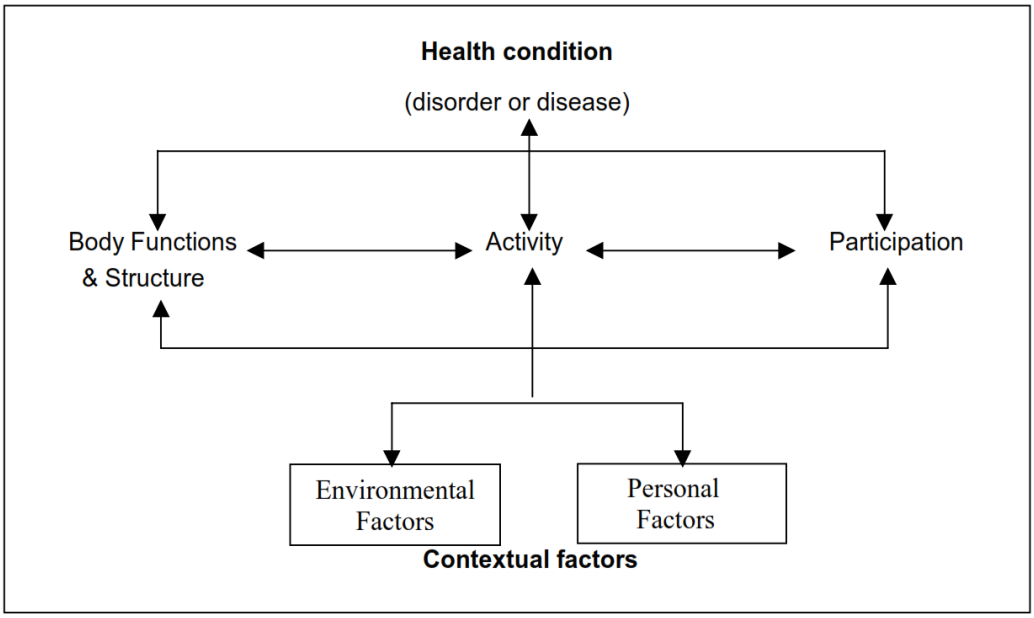


Figure 13 ICF model (WHO, 2002)

This figure classifies the three levels of human functioning by ICF: functioning at the level of body or body part, the whole person, and the whole person in a social context. And disability refers to impairment, activity limitations. The definitions of these components of ICF are provided in the box below (WHO, 2002).

Body Functions are physiological functions of body systems (including psychological functions).

Body Structures are anatomical parts of the body such as organs, limbs and their components.

Impairments are problems in body function or structure such as a significant deviation or loss.

Activity is the execution of a task or action by an individual.

Participation is involvement in a life situation.

Activity Limitations are difficulties an individual may have in executing activities.

Participation Restrictions are problems an individual may experience in involvement in life situations.

Environmental Factors make up the physical, socal and attitudinal environment in which people live and conduct their lives..

Figure 14 Component of ICF model (WHO, 2002)

ICF model can be used in identifying post and acute musculoskeletal disorder, developing assessment tools and setting the interdisciplinary. The present ICF model is consistent communication and sharing the information in term of health professionals and can help patients to easily understand health (Monika Sxheuringer et al., 2005).

CHAPTER III
METHODOLOGY

3.1 Research Design

The study was a cross-sectional study conducted during April period of 2015

3.2 Study Area

Electricity Generating Authority of Thailand (EGAT) is Thailand's leading state-owned power utility under the Ministry of Energy, responsible for electric power generation and transmission for the whole country. EGAT are the largest power producer in Thailand, owning and operating power plants of different types and sizes which are located in 40 sites across the country. Power generation facilities consists of 3 thermal power plants, 6 combined cycle power plants, 22 hydropower plants, 8 renewable energy plants, and a diesel power plant. In 1953, an abundant lignite resource was found at Mae Moh basin. This is the only and biggest area of lignite power plant in Thailand (EGAT, 2015).

Area of the research was conducted at Electricity Generating Authority of Thailand (EGAT) Mae Moh sub district, Lampang province.

Figure 15 Mae Moh EGAT, Lampang lignite power plant (M. M. EGAT, 2012)

3.3 Study Population

All of the maintenance industry workers in EGAT, Lampang are 1033.

3.4 Inclusion & Exclusion Criteria

3.4.1 Inclusion Criteria

The selection criteria was as follows:

- voluntary participants (was participate)
- working as maintenance worker including welder and turner at EGAT, Lampang for at least 1 years.

3.4.2 Exclusion Criteria

Participants with any of the following conditions was ineligible

- Had the previous history of diagnosis of bone or muscular diseases Specific in bone fracture or caused by accident
- Foreigner worker
- Changed from maintenance worker to other job

3.5 Sample and sample size

The sample size is calculated by Yamane Formula (Israel, 1992)

$$n = \frac{N}{1 + Ne^2}$$

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n = the sample size

N = the population size

e = the level of precision (0.05)

N = total number of maintenance industry workers in Electricity Generating Authority of Thailand (EGAT), Lampang is 1033 people

e = The error assume 5 %

$$n = \frac{1033}{1 + (1033)(0.05)(0.05)}$$

n = 288

Total sample size + 10% sample loss= 288 + 28.8 persons

This study was be collected the data from 317 maintenance workers in EGAT, Lampang.

3.6 Sampling Technique

Electricity Generating Authority of Thailand (EGAT) includes twelve power-plants: Mae Moh, Bang Pakong, North Bangkok power plant, Krabi, South Bangkok, Nam Phong, Surat Thani, Chana, Lan Krabue, Wang Noi, Lan Ta Khong, Hypro powerplant, Lam Ta Khong wind powerplant. Mae Moh power-plant is one of the lignite fuel and the biggest lignite source in Asia.

Selection of maintenance industry workers in Mae Moh power plant located in Mae Moh sub-district, Mae Moh district, Lampang province was done by a purposive sampling. Workers were selected by systematic random sampling with every 3 workers' name listed was selected to participate in this study.

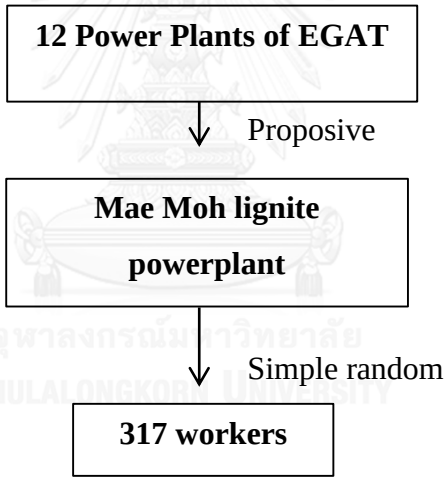

Figure 16 Sampling Technique

3.7 Research Instrument

3.7.1 Questionnaire

Questionnaire was separated into 5 parts; first and second parts were open ended and close ended questions.

Part 1 Personal characteristic including age, gender, education level congenital disease, exercise, smoking, drinking, leisure and second job present 12 questions (Polruk, 2013).

Part 2 Job characteristic including work experience, work duty(welder, turner), work place, duration of wok, break time and weight of tools present 8 questions (Jidapa Polruk, 2013)

Part 3 Physical work environment including of the frequency of postural and duration of postural present 24 questions (Songkham, 2011).

Part 4 Psychosocial is about stress in workplace present 10 questions. In each item has 4 scale; Seldom = 1, Sometimes = 2, Often = 3 and Always = 4 (Mostafa Ghaffari, 2006).

Part 5 Standardized Nodic Musculoskletal Questionnaire for Musculoskeletal in general part of questionnaire have 9 questions. If check ‘‘Yes’’ means present the symptom of musculoskeletal disease (Kuorinka, 1987).

In this study, according to the Nodic questionnaire researcher regarded all the pain from MSDs within 7 days as acute phase. The pain from either episodic attack or persisted for one year was regarded as chronic phase.

3.8 Data Collection Processing

Questionnaire was distributed to maintenance workers in EGAT, Lampang, by face to face interview technique.

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3.9 Data Analysis Processing

Data entry and analysis was done by SPSS 17. The personal characteristics of age were described by mean age and standard deviation; the age groups, gender were described by frequency table.

The prevalence of musculoskeletal disorder in maintenance workers were described by the frequency tables and charts.

The risk factors and associated between the musculoskeletal disorders were determined by chi square and P value of equal or less than 0.05 were as the significance level.

Chi-square test will used to find an association between:

Personal characteristic and MSD

Physical work environment and MSD

Psychosocial and MSD

Odd ratio with 95 % CI will used to find the risk factors; Odd ratio more than 1 is risk.

3.10 Reliability and Validation study of the instrument

The developed instrument tested validity and reliability. Validity was reviewed by 3 experts as following;

1. Mr. Kawee Intashothi, Engineer level 10, EGAT Lampang.
2. Mr. Prawit Thongloi, Head of environment and occupation department, EGAT Lampang.
3. Ms. Metida Khumjorhor, Occupational Therapist, Professional level, Lampang hospital.

An index of the Item Objective Congruence)IOC (of the questionnaire was 0.85-0.95 in each item and overall of questionnaire was more than 0.8.

The reliability of the new instrument was test via a maintenance worker test in a group of 30 person in EGAT, Nonthaburi. After try pick up the questionnaire and use the Cronbach's Alpha and KR -20)Kuder–Richardson Formula 20) measure for dichotomous items. The Cronbach's Alpha was more than 0.8.

3.11 Ethical Consideration

This study was approved by the ethical consideration from Research Involving Human Research Subject, Health Sciences Group, Chulalongkorn University with the certified code no. 0.71.1/58. All respondents were informed about this study before participating .The consent from will be signed by subjects before report questionnaire.

Chapter IV
Results

4. Results

In this chapter is based on cross-sectional design which aim to find out the prevalence and risk factors of musculoskeletal disease in 317 maintenance workers in Lampang province, Thailand. Furthermore, the use of questionnaires were tested the validity and reliability.

This result has 5 parts including

4.1: Personal characteristics and Job characteristics

4.2: Physical Factors

- Frequency of work postural
- Duration of work postural

4.3: Psychosocial Factors

4.4: Prevalence of musculoskeletal disorder symptom among the maintenance worker

4.5: The association between risk factors and musculoskeletal disorder symptom

- Personal characteristics and job characteristics
- Physical factors
- Psychosocial factors

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4.1 Personal characteristics and Job characteristics among maintenance workers

The information of 317 participants' maintenance workers had been collected and showed a response rate of 100%. The Personal characteristics and job characteristics among maintenance workers in this study are showed in Table 2 and 3

Table 2 Personal characteristics among maintenance workers. The age of participants almost more than 50 years old (51.4%) with mean of 45.66 years old (S.D. = 12.32) and age range between 21-60 years. Largely participants was male (96.8%). About body mass index (BMI) that separated by Asian standard (Asian, 2004) showed 70.7% of maintenance workers have overweight mean of 24.72 years (S.D. = 24.72) and range between 15.53-35.26. For education level, the most participants had under graduation was 76.7% and income ranged more than 50,000 bath per month was 57.1%. The exercise of participants were less than 3 times per week in 45.4 % and more or equal 3 times per week in 41.0%. The current drinker and smoker are respectively 67.5% and 19.9%. Most participants had congenital disease included hypertension (62.8%), diabetic (6.0%), heart disease (0.6%) and other diseases. For others were including allergy, breathless, hyperlipidemia, anemia and kidney cancer. Participants had leisure about 30%. Mostly they like to see the movie, sing a song and garden. Some of participants had second job or alternative job was 12.6 %. The example of alternative income was trade, vehicle workshop and apartment rental service.

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Table 2 Personal characteristics among maintenance workers in EGAT (n=317)

Personal Characteristics	n	%
Age		
Less than 30 years old	79	24.9
31 – 40 years old	12	3.8
41 – 50 years old	63	19.9
> 50 years old	163	51.4
Mean (S.D.) 45.66 (± 12.32)		
Range 21-60		
Gender		
Male	307	96.8
Female	10	3.2
BMI		
Underweight	9	2.8
Normal	84	26.5
Overweight	224	70.7
Mean (S.D.) 24.72 (± 3.37)		
Range 16.53 - 35.26		
Education level		
Under graduated degree	243	76.7
Graduated or above graduated degree	74	23.3
Income		
Less than 20,000 Bath	80	25.2
20,000 – 30,000 Bath	15	4.7
30,000 – 40,000 Bath	8	2.5
40,000 – 50,000 Bath	33	10.4
> 50,000 Bath	181	57.2

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Table 2 Personal characteristics among maintenance workers in EGAT (cont.)

Personal Characteristics	n	%
Exercise		
Never	43	13.6
< 3 times/week	144	45.4
≥ 3 times/week	130	41.0
Alcohol drinking		
Current drinker	214	67.5
Stop drinking	80	25.2
Never drink	23	7.3
Cigarette smoking		
Current smoker	63	19.9
Stop smoking	122	38.5
Never smoke	132	41.6
Health problems		
Hypertension	80	62.8
Heart disease	2	0.6
Diabetic	19	6.0
Other	38	12.0
Leisure		
Yes	95	30.0
No	222	70.0
Second job		
Yes	40	12.6
No	277	87.4

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Table 3 Job characteristics

Most of the participants presented more than 10 years in this factory. Some of them were 68% in the other work position. Mostly, they are maintenance workers for more than 15 years (63.7%). It found that most of the job duty was turner about 59.0% and welder was 41.0 %.Work area are including ground (59.9 %), height working area (12.0%), narrow space (15.1%), and air confine space (12.9%). Estimate weight of tools

normally was 1-5 kilograms (35.8%). Most of them spent time in one work more than 30 minutes (74.8%) and in one day for 1-5 works (60.9%). About 49.2 %, they spent over time more than 30 hours per month and break time was mostly more than 30 minutes (27.8%).

Table 3 Job Characteristics among maintenance workers in EGAT, Lampang (n=317)

Job Characteristics	n	%
Year of work		
1 - 5 years	82	25.9
6 - 10 years	14	4.4
> 10 years	221	69.7
Other work position		
Yes	68	21.5
No	249	78.5
Year in maintenance worker		
Less than 5 years	81	25.6
6 - 15 years	34	10.7
> 15 years	202	63.7
Job duty		
Welder	130	41
Turner	187	59
Work area		
Ground	190	59.9
Height working area	38	12.0
Narrow space	48	15.1
Air confine space	41	13.0
Duration per one work		
Less than 10 minutes	25	11.8
11 - 30 minutes	55	17.4
> 30 minutes	237	74.8

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Table 3 Job Characteristics among maintenance workers in EGAT, Lampang (cont.)

Job Characteristics	n	%
Over time (hours each month)		
Less than 10 hours	58	18.3
11 - 30 hours	103	32.5
> 30 hours	156	49.2
Break time (minute/session)		
Less than 10	48	15.1
11 - 20 minutes	85	26.8
21 - 30 minutes	96	30.3
> 30 minutes	88	27.8
Estimate weight of tools (kilogram)		
< 1 kilogram	77	24.2
1 - 5 kilograms	114	35.8
5 - 10 kilograms	60	18.9
> 10 kilograms	66	20.8
Maintenance workload/day		
1 - 5 works	193	60.9
6 - 10 works	59	18.6
> 10 works	65	20.5

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4.2 Physical Factors

4.2.1 Frequency of work postural

In the **Table 4** presented the frequency of work postural separated in 4 level are never, 1-2 time/day, 3-10 times/day and more than 10 times/day in each parts of the body.

Frist, trunk in upright position was mostly in 3-10 times/day (36.9%). Slightly flexion (39.3%), twist (47.3%) and lateral bend (43.8) were mostly in 1-2 times/day. Prone was mostly never (44.2%). Second, both arms below shoulder (37.9%), one arm below shoulder (45.7%) and both arms above shoulder (51.1%) were commonly in 1-2 times/day.Third, cylindrical grasp (37.2%), hook (48.6%), tripod (37.9%) and spherical grasp (39.1%) were more frequency in 1-2 times/day. Forth, leg part, sit (35.6%) and

stand (36.9%) were largely in 3-10 times/day. Squat (45.7%) was mostly in 1-2 times/day. Kneeling with one knee never (38.2%) and 1-2 times/day (38.2%). Kneeling with both knees (34.1%) never do in a day. Walk was most frequency more than 10 times/day (38.8%). Fifth, lifted/carried with bend down trunk, light (51.1%) and medium (44.2%) were commonly in 1-2 times/day. Most of the participants never lifted/carried heavy (50.0%) in one day. Sixth, lifted/carried with upright trunk, light (55.8%) and medium (49.5%) were generally in 1-2 time/day. Ordinarily of participants never lifted/carried heavy (48.6%).

Table 4 Frequency of work postural (n=317)

Postural	**Frequency of work postural n (%)**			
	Never	**1 - 2 times/day**	**3 - 10 times/day**	**> 10 times/day**
Trunk				
Upright	20 (6.3)	96 (30.3)	117 (36.9)	84 (26.5)
Slightly flexion	25 (7.9)	125 (39.3)	114 (36.0)	53 (16.8)
Twist	56 (17.7)	150 (47.3)	74 (23.3)	37 (11.7)
Lateral Bend	78 (24.6)	139 (43.9)	73 (23.0)	27 (8.5)
Prone	140 (44.2)	134 (44.2)	29 (9.2)	14 (4.4)
Arm				
Both arms below shoulder	28 (8.8)	120 (37.9)	94 (29.6)	75 (23.7)
One arm below shoulder	54 (17.0)	145 (45.7)	94 (29.7)	24 (7.6)
Both arms above shoulder	74 (23.3)	162 (51.1)	66 (20.9)	15 (4.7)
Grasp				
Cylindrical	46 (14.5)	118 (37.3)	97 (30.6)	56 (17.6)
Hook	75 (23.7)	154 (48.6)	71 (22.4)	17 (5.3)
Tripod	31 (9.9)	120 (37.9)	94 (29.6)	72 (22.6)
Spherical	110 (34.7)	124 (39.1)	74 (23.3)	9 (2.9)

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Table 4 Frequency of work postural (n=317) (cont.)

Postural	Frequency of work postural n (%)			
	Never	**1 - 2 times/day**	**3 - 10 times/day**	**> 10 times/day**
Leg				
Sit	30 (9.5)	88 (27.8)	113 (35.6)	86 (27.1)
Stand	17 (5.4)	109 (34.4)	117 (36.9)	74 (23.3)
Squat	72 (22.7)	145 (45.7)	82 (25.9)	18 (5.7)
Kneeling with one knee	121 (38.2)	121 (38.2)	62 (19.6)	13 (4.0)
Kneeling with both knees	130 (41.0)	108 (34.0)	62 (19.6)	17 (5.4)
Walk	17 (5.4)	71 (22.4)	106 (33.4)	123 (38.8)
Lifted/carried with bend down trunk				
Light	68 (21.5)	162 (51.1)	65 (20.5)	22 (6.9)
Medium	104 (32.8)	140 (44.2)	61 (19.2)	12 (3.8)
Heavy	159 (50.1)	120 (37.9)	28 (8.8)	10 (3.2)
Lifted/carried with upright trunk				
Light	62 (19.6)	177 (55.8)	61 (19.2)	17 (5.4)
Medium	95 (30.0)	157 (49.5)	54 (17.0)	11 (3.5)
Heavy	154 (48.6)	125 (39.4)	26 (8.2)	12 (3.8)

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4.2.2 Duration of work postural

Table 5 described the duration in each posture that separated in 4 level are never, 1-15 minutes, 16-30 minutes and more than 30 minutes.

In each body parts, most of the postures were in 1-15 minutes including trunk in upright position (48.6%), trunk slightly flexion (61.0%), trunk twist (59.6%), lateral bend of trunk (56.2%), both arms below shoulder (53.0%), one arm below shoulder (61.8%), both arms above shoulder (57.1 %), cylindrical grasp (56.5 %), hook (48.6%), tripod grasp (51.4%), spherical grasp (49.2%), sit (36.0), stand (47.6), squat (54.6), kneeling with one knee (38.2%), kneeling with both knees (41.6%), walk(42.6%),

lifted/carried with bend down trunk in light (62.8%), medium (53.9%), heavy (49.8%) and lifted/carried with upright trunk in light (67.5%) and medium (56.5%).And all of the participants never prone (43.5%), kneeling with one knee (38.2%) and lifted/carried with heavy upright trunk (47.9%(.

Table 5 Duration of work postural in worker (n=317)

Postural	Duration of work postural n (%)			
	Never	**1 – 15 minutes**	**16 -30 minutes**	**> 30 minutes**
Trunk				
Up right	18 (5.7)	154 (48.6)	77 (24.3)	68 (21.5)
Slightly flexion	24 (7.6)	194 (61.0)	58 (18.3)	41 (12.9)
Twist	55 (17.4)	189 (59.6)	35 (11.0)	38 (12.0)
Lateral Bend	77 (24.3)	178 (56.2)	31 (9.8)	31 (9.8)
Prone	138 (43.5)	117 (36.8)	36 (11.4)	26 (8.2)
Arm				
Both arms below shoulder	28 (8.8)	168 (53.0)	60 (18.9)	61 (19.2)
One arm below shoulder	54 (17.0)	196 (61.8)	42 (13.2)	25 (7.9)
Both arms above shoulder	74 (23.3)	181 (57.1)	39 (12.3)	23 (7.3)
Grasp				
Cylindrical	45 (14.2)	179 (56.5)	56 (17.7)	37 (11.7)
Hook	75 (23.7)	154 (48.6)	71 (22.4)	17 (5.4)
Tripod	31 (9.8)	163 (51.4)	73 (23.0)	50 (15.8)
Spherical	110 (34.7)	156 (49.2)	39 (12.3)	12 (3.8)
Leg				
Sit	29 (9.1)	114 (36.0)	80 (25.2)	94 (29.7)
Stand	16 (5.0)	151 (47.6)	90 (28.4)	60 (18.9)
Squat	72 (22.7)	173 (54.6)	51 (16.0)	21 (6.6)
Kneeling with one knee	121 (38.2)	121 (38.2)	62 (19.6)	13 (4.1)
Kneeling with both knees	130 (41.0)	132 (41.6)	35 (11.0)	20 (6.3)
Walk	17 (5.4)	135 (42.6)	73 (23.0)	92 (29.0)

Table 5 Duration of work postural in worker (n=317) (cont.)

Postural	Time motions continued n (%)			
	Never	**1 – 15 minutes**	**16 -30 minutes**	**> 30 minutes**
Lifted/carried with upright trunk				
Light	61 (19.2)	214 (67.5)	31 (9.8)	11 (3.5)
Medium	92 (29.0)	179 (56.5)	37 (11.7)	9 (2.8)
Heavy	152 (47.9)	133 (42.0)	20 (6.3)	12 (3.8)
Lifted/carried with bend down trunk				
Light	67 (21.1)	199 (62.8)	32 (10.1)	19 (6.0)
Medium	103 (32.5)	171 (53.9)	30 (9.5)	13 (4.1)
Heavy	158 (49.8)	132 (41.6)	17 (5.4)	10 (3.2)

4.3 Psychosocial Factors

The percentage of psychosocial exposure in yes (grouped strong agree and agree to yes) and no (grouped disagree and strongly agree to no) presented in **table 6**. The most of participants were choose no more than yes. For the content can find out that they feel uninteresting work was 21.1% and 10% of them are boring at work. 11.4 % feel there is no encouraging from organization culture, no support from superior 20.8% and rest of 9.4%. There is no support from fellow workers 9.4% and no support if trouble at work 13.2%. The rest of the answers was described as 8.6% could not control work, could not get the quantitative demand 9.7%, and could not get the qualitative demand 9.2%, feels anxiety about change in workplace 26.1%.

Table 6 Psychosocial Exposure in workers (n=317)

Psychosocial Exposure	Level (n%)	
	Yes	**No**
Uninteresting work	67 (21.1)	250 (78.9)
Boring work	32 (10.0)	285 (90.0)
No encouraging organization culture	36 (11.4)	281(88.6)
No support from superior	66 (20.8)	251 (79.2)
No support from fellow workers	30 (9.4)	287 (90.6)
No support if trouble at work	42 (13.2)	275 (86.7)
Can not control at work	27 (8.6)	296 (91.5)
Can not get the quantitative demand	31 (9.7)	286 (90)
Can not get the qualitative demand	29 (9.2)	288 (87.8)
Feel anxiety about change in workplace	83 (26.1)	234 (73.8)

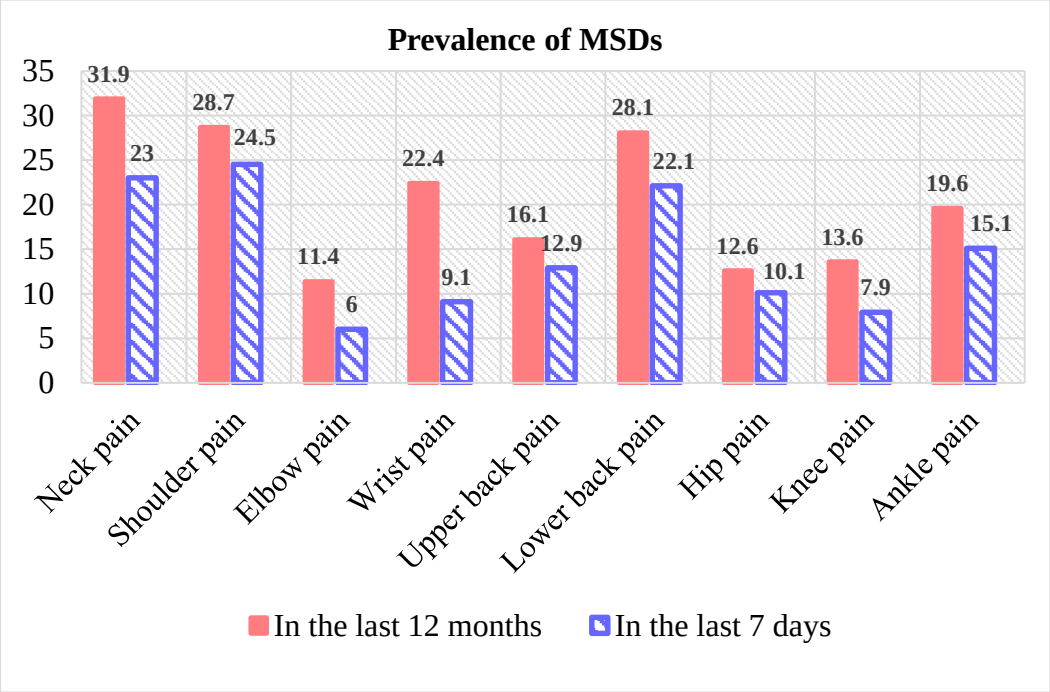
4.4 Prevalence of musculoskeletal disorder symptom among the maintenance worker in EGAT, Lampang

The participants of this study were the maintenance worker in Lampang province, Thailand that working as maintenance worker at least 6 months. **Table 7** and **figure 17** appearance the prevalence of musculoskeletal disorder in each part among maintenance workers at Lampang, Thailand. The highest prevalence of MSDs in past 12 months were neck pain, shoulder pain and lower back pain. And the most MSDs in past 7 days were shoulder pain, neck pain and lower back pain.

Table 7 Prevalence of musculoskeletal disorder symptom among maintenance worker at EGAT, Lampang

Prevalence of MSDs	MSDs in past 12 months	MSDs in past 7 days
Neck pain	31.9	23.0
Shoulder pain	28.7	24.5
Elbow pain	11.4	6.0
Wrist pain	22.4	9.1
Upper back pain	16.1	12.9
Lower back pain	28.1	22.1
Hip pain	12.6	10.1
Knee pain	13.6	7.9
Ankle pain	19.6	15.1

Figure 17 Prevalence of musculoskeletal disorder symptom among maintenance worker at EGAT, Lampang



4.5 Association between risk factors and musculoskeletal disorder.

Chi-Square test to find the association between personal characteristics (including age, gender, BMI, education level, income, exercise, alcohol drinker, cigarette smoker, congenital disease, leisure and second job) and MSDs. To presenting p-value <0.05 is mean significantly in this study.

4.5.1 Personal characteristics and Job characteristics

Personal characteristics of participants showed significant difference except education level associated with MSDs in past 12 months (p = 0.020) and MSDs in 7 day (p = 0.019) and other health problems in past 7 days (p = 0.034) that shown in **table8**.

Table 8 Personal Characteristics associated with MSDs among maintenance worker

Factor	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Age								
<30 years old	79	24.9	57	18	0.671	50	15.8	0.407
31-40 years old	12	3.8	8	2.5		7	2.2	
41-50 years old	63	19.9	40	12.6		31	9.8	
>50 years old	163	51.4	106	33.4		95	30	
Gender								
Male	307	96.8	204	64.4	0.815	176	55.5	0.425
Female	10	3.2	7	2.2		7	2.2	
BMI								
Underweight	9	2.8	7	2.2	0.719	6	1.9	0.539
Normal	84	26.5	57	18.0		52	16.4	
Overweight	224	70.7	147	46.4		125		

Table 8 Personal Characteristics associated with MSDs among maintenance worker (n=317) (cont.)

Factor	Workers		MSDs in past 12 months		P valve	MSDs in past 7 days		P valve
	n	%	n	%		n	%	
Education level								
Under graduated	243	76.7	170	53.6	0.020*	149	47.0	0.019*
Above graduated	74	23.3	41	12.9		34	10.7	
30,000 – 40,000	8	3.5	4	1.3		3	0.9	
40,000 – 50,000	33	10.4	22	6.9		18	5.7	
> 50,000	181	57.1	118	37.2		104	32.8	
Alcohol drinking								
Current drinker	214	67.5	142	44.8	0.973	120	37.9	0.626
Ex - smoking	80	25.2	54	17.0		48	15.1	
Never drinker	23	7.3	15	4.7		15	4.7	
Cigarette smoking								
Current smoker	63	19.9	44	13.9	0.628	37	11.7	0.457
Ex - smoker	122	38.5	83	26.2		75	23.7	
Never smoker	132	41.6	84	26.5		71	22.4	
Health problems								
Hypertension	80	62.8	58	18.3	0.193	50	15.8	0.318
Heart disease	2	0.6	2	0.6	0.315	2	0.6	0.225
Diabetic	19	6	15	4.7	0.238	15	4.7	0.053
Other	38	12	30	9.5	0.085	28	8.8	0.034

*** means significant, Chi-square test**

1 USA = 31 THB

Table 8 Personal Characteristics associated with MSDs among maintenance worker (n = 317) (cont.)

Factor	study population		MSDs in past 12 months		P valve	MSDs in past 7 days		P valve
	n	%	n	%		n	%	
Leisure								
Had leisure	95	30	66	20.8	0.472	60	18.9	0.201
Not had leisure	222	70	145	45.7		123	38.8	
Secondary job								
Yes	40	12.6	23	7.3	0.194	20	6.3	0.290
No	277	87.4	188	59.3		163	51.4	

The associated between job characteristics and MSDs that shown from **table 9**, had no significantly except work area MSDs in past 7 days (p = 0.017). And over time with MSDs in past 12 months (p = 0.012) and MSDs in past 7 days (p = 0.019).

Table 9 Job Characteristics associated with MSDs among maintenance worker (n = 317)

Factors	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Year of work								
1 -5 years	82	25.9	58	18.3	0.568	48	15.1	0.543
6 – 10 years	14	4.4	10	3.2		10	3.2	
> 10 years	221	69.7	143	45.1		125	39.4	
Other work position								
Yes	68	21.5	43	13.6	0.512	36	11.4	0.367
No	249	78.5	168	53.0		32	10.1	

Table 9 Job Characteristics associated with MSDs among maintenance worker (n = 317) (cont.)

Factors	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Year in maintenance								
< 5 years	81	25.6	57	18	0.667	49	15.5	0.367
6 – 15 years	34	10.7	23	7.3		19	6.0	
> 15 years	202	63.7	131	41.3		115	36.3	
Job duty								
Welder	130	41	90	28.4	0.401	75	23.7	0.991
Turner	187	59	121	38.2		108	34.1	
Work area								
Ground	190	59.9	116	36.6	0.06	97	30.6	0.017*
Height working area	38	12.0	28	8.8		24	7.6	
Narrow space	48	15.1	34	10.7		31	9.8	
Air confine space	41	12.9	33	10.4		31	9.8	
Duration/work (minute/work)								
< 10 minutes	25	11.7	17	5.4	0.977	15	4.7	0.893
11 – 30 minutes	55	17.4	37	11.7		33	10.4	
> 30 minutes	237	74.8	157	49.5		135	42.6	
Over time (hour/day)								
< 10 hours	58	18.3	30	9.5	0.012*	27	8.5	0.019*
11 - 30 hours	103	32.5	67	21.1		54	17	
> 30 hours	156	49.2	114	36.0		102	32.2	

*** means significant, Chi-square test**

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Table 9 Job Characteristics associated with MSDs among maintenance worker (n = 317) (cont.)

Factors	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Duration/work (minute/work)								
< 10 minutes	25	11.7	17	5.4	0.977	15	4.7	0.893
11 – 30 minutes	55	17.4	37	11.7		33	10.4	
> 30 minutes	237	74.8	157	49.5		135	42.6	
Estimated Weight of tools (kilogram)								
< 1 kilogram	77	24.3	52	16.4	0.801	48	14.5	0.684
1 - 5 kilograms	114	36.0	72	22.7		61	19.2	
6 - 10kilograms	60	18.9	41	12.9		35	11.0	
> 10 kilograms	66	20.8	46	14.5		41	12.9	
Maintenance workload (work/day)								
1 - 5 works	193	60.9	125	39.4	0.351	105	33.1	0.311
6 - 10 works	59	18.6	44	13.9		38	12.0	
> 10 works	65	20.5	42	66.6		40	12.6	

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4.5.2 Physical factors

Physical factors were including frequency of work postural and duration of work. **Table 10** shown associated between frequency of work postural and MSDs, there had no significantly except frequency of trunk slightly flexion (p = 0.022), prone (p = 0.011), stand (p = 0.028), lifted/carried with bend down trunk in light weight (p = 0.034), lifted/carried with bend down trunk in medium weight (p = 0.019) and lifted/carried with upright trunk in light weight (p = 0.037) with MSDs in past 12 months. And there had significant difference between MSDs in past 7 day with trunk slightly flexion (p = 0.012) and stand (p = 0.026).

Table 10 Associated between frequency of work postural and MSDs (n =317)

Trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Upright								
Never	20	6.3	13	4.1	0.989	10	3.2	0.662
1-2 times/day	96	30.3	65	20.5		59	18.6	
3-10 times/day	117	36.9	78	24.6		64	20.2	
> 10 times/day	84	26.5	55	17.4		50	15.8	
Slightly flexion								
Never	25	7.9	11	3.5	0.022*	9	2.8	0.012*
1-2 times/day	125	39.3	82	25.9		68	21.5	
3-10 times/day	114	36.0	76	24.0		67	21.1	
> 10 times/day	53	16.7	42	13.2		39	12.3	
Twist								
Never	56	17.7	30	9.5	0.122	29	9.1	0.416
1-2 times/day	150	47.3	107	33.8		89	28.1	
3-10 times/day	74	23.3	49	15.5		40	12.6	
> 10 times/day	37	11.7	25	7.9		25	7.9	
Lateral Bend								
Never	78	24.6	45	14.2	0.278	39	12.3	0.445
1-2 times/day	139	43.8	98	30.9		84	26.5	
3-10 times/day	73	23.0	50	15.8		43	13.6	
> 10 times/day	27	8.5	18	5.7		17	5.4	

***means significant, Chi-square test**

Table 10 Associated between frequency of work postural and MSDs (n=317) (cont.)

Trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Prone								
Never	140	44.2	84	26.5	0.011*	75	23.7	0.214
1-2 times/day	134	44.2	101	31.9		84	26.5	
3-10 times/day	29	9.1	15	4.1		14	4.4	
> 10 times/day	14	4.4	11	3.1		10	3.2	
Arm								
Both arms below shoulder								
Never	28	8.8	17	5.4	0.710	16	5.0	0.866
1-2 times/day	120	37.9	84	26.5		71	22.4	
3-10 times/day	94	29.4	60	18.9		51	16.1	
> 10 times/day	75	23.7	50	15.8		45	14.2	
One arm below shoulder								
Never	54	17.0	31	9.8	0.285	28	8.8	0.246
1-2 times/day	145	45.7	102	32.2		88	27.8	
3-10 times/day	94	29.7	64	20.2		57	18.0	
> 10 times/day	24	7.6	14	4.4		10	3.2	
Both arms above shoulder								
Never	74	23.3	44	13.9	0.446	37	11.7	0.447
1-2 times/day	162	51.1	109	34.4		98	30.9	
3-10 times/day	66	20.8	47	14.8		40	12.6	
> 10 times/day	15	4.7	11	3.5		8	2.5	

*** means significant, Chi-square test**

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Table 10 Associated between frequency of work postural and MSDs (cont.)

Grasp	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Cylindrical Grasp								
Never	46	14.5	27	8.5	0.365	26	8.2	0.950
1-2 times/day	118	37.2	85	26.8		70	21.1	
3-10 times/day	97	30.6	62	19.6		54	17.0	
> 10 times/day	56	17.6	37	11.7		33	10.4	
Hook								
Never	75	23.7	45	14.2	0.552	40	12.6	0.727
1-2 times/day	154	48.6	107	33.8		90	28.4	
3-10 times/day	71	22.4	48	15.1		44	13.9	
> 10 times/day	17	5.3	11	3.5		9	2.8	
Tripod								
Never	31	9.8	23	7.3	0.481	20	6.3	0.398
1-2 times/day	120	37.9	78	24.6		69	21.8	
3-10 times/day	94	29.6	66	20.8		58	18.3	
> 10 times/day	72	22.6	44	13.9		36	11.4	
Spherical								
Never	110	34.7	70	22.1	0.710	60	18.9	0.624
1-2 times/day	124	39.1	86	27.1		76	24.0	
3-10 times/day	74	23.3	50	15.8		43	13.6	
> 10 times/day	9	2.8	5	1.6		4	1.3	

Table 10 Associated between frequency of work postural and MSDs (n = 317) (cont.)

Leg	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Sit								
Never	30	9.5	24	7.6	0.166	20	6.3	0.144
1-2 times/day	88	27.8	63	19.9		58	18.3	
3-10 times/day	113	35.6	71	22.4		60	18.9	
> 10 times/day	86	27.1	53	16.7		45	4.2	
Stand								
Never	17	5.4	11	3.5	0.028	11	3.5	0.026
1-2 times/day	109	34.4	83	26.2		72	22.7	
3-10 times/day	117	36.9	67	21.1		55	17.4	
> 10 times/day	74	23.3	50	15.8		45	14.2	
Squat								
Never	72	22.7	45	14.2	0.411	38	12.0	0.508
1-2 times/day	145	45.7	101	31.9		85	26.8	
3-10 times/day	82	25.9	51	16.1		47	14.8	
> 10 times/day	18	5.7	14	4.4		13	4.1	
Kneeling with one knee								
Never	121	38.2	78	24.6	0.839	66	20.8	0.821
1-2 times/day	121	38.2	84	26.5		73	23.0	
3-10 times/day	62	19.6	40	12.6		36	11.4	
> 10 times/day	13	4.1	9	2.8		8	2.5	
Kneeling with both knees								
Never	130	41.0	85	26.8	0.156	71	22.4	0.128
1-2 times/day	108	34.1	78	24.6		68	21.5	
3-10 times/day	62	19.6	35	11.0		31	9.8	
> 10 times/day	17	5.4	13	4.1		13	4.1	
Walk								
Never	17	5.4	12	3.8	0.676	10	3.2	0.396
1-2 times/day	71	22.4	50	15.8		46	14.5	
3-10 times/day	105	33.1	66	20.8		55	17.4	
> 10 times/day	123	38.8	83	26.2		72	22.7	

Table 10 Associated between frequency of work postural and MSDs (n = 317) (cont.)

Lifted/carried with bend down trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Light								
Never	68	21.5	36	11.4	0.034*	33	10.4	0.374
1-2 times/day	162	51.1	118	37.2		97	30.6	
3-10 times/day	65	20.5	42	13.2		39	12.3	
> 10 times/day	22	6.9	15	4.7		14	4.4	
Medium								
Never	104	32.8	59	18.6	0.019*	51	16.1	0.064
1-2 times/day	140	44.2	101	31.9		84	26.5	
3-10 times/day	61	19.2	40	12.6		38	12.0	
> 10 times/day	12	3.8	11	3.5		10	3.2	
Heavy								
Never	159	50.0	101	31.9	0.410	83	26.2	0.134
1-2 times/day	120	37.9	85	26.8		76	24.0	
3-10 times/day	28	8.8	17	54		16	5.0	
> 10 times/day	10	3.2	8	2.5		8	2.5	

*** means significant, Chi-square test**

Table 10 Associated between frequency of work postural and MSDs (n = 317) (cont.)

Lifted/carried with upright trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Light								
Never	62	19.6	34	10.7	0.037*	32	10.1	0.138
1-2 times/day	177	55.8	121	38.2		101	31.9	
3-10 times/day	61	19.2	41	12.9		36	11.4	
> 10 times/day	17	3.8	15	4.7		14	4.4	
Medium								
Never	94	29.6	57	18	0.421	48	15.1	0.339
1-2 times/day	157	49.5	108	34.1		93	29.3	
3-10 times/day	54	17.0	37	11.7		35	11.0	
> 10 times/day	12	3.8	9	2.8		7	2.2	
Heavy								
Never	154	48.6	103	32.5	0.224	83	26.2	0.071
1-2 times/day	125	39.4	82	25.9		75	23.7	
3-10 times/day	26	8.2	15	4.7		14	4.4	
> 10 times/day	12	3.8	11	3.5		11	3.5	

*** means significant, Chi-square test**

Duration of work postural and MSDs, in past 12 months the most participants had not associated except trunk slightly flexion (p = 0.044), trunk twist (p = 0.035), cylindrical grasp (p = 0.009), lifted/carried with bend down trunk in light weight (p = 0.042). And in past 7 days, there had significant difference in tripod grasp (p = 0.042) presented in **Table 11.**

Table 11 Duration of work postural and MSDs (n = 317)

Trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Upright								
Never	18	5.7	11	3.5	0.957	9	2.8	0.488
1-15 minutes	154	48.6	102	32.2		89	28.1	
16-30 minutes	77	24.3	52	16.4		41	12.9	
>30 minutes	68	21.5	46	14.5		44	13.9	
Slightly flexion								
Never	24	7.6	10	32	0.044*	8	2.5	0.076
1-15 minutes	194	61.0	133			113	35.6	
16-30 minutes	58	18.3	42			36	11.4	
>30 minutes	41	12.9	26			26	8.2	
Twist								
Never	55	17.4	29	9.1	0.035*	28	8.8	0.602
1-15 minutes	189	59.6	137	43.2		112	35.3	
16-30 minutes	35	11.0	21	6.6		19	6.0	
>30 minutes	38	12.0	24	7.6		24	7.6	
Lateral Bend								
Never	77	24.3	44	13.9	0.103	38	12.0	0.360
1-15 minutes	178	56.2	127	0.103		107	33.8	
16-30 minutes	31	9.8	22	6.9		20	6.3	
>30 minutes	31	9.8	18	5.7		18	5.7	

***means significant, Chi-square test**

Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Trunk	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Prone								
Never	138	43.5	84	26.5	0.242	75	23.7	0.745
1-15 minutes	117	36.8	83	26.2		71	22.4	
16-30 minutes	36	11.4	27	8.5		22	6.9	
>30 minutes	26	8.2	17	5.4		15	4.7	
Arm								
Both arms below shoulder								
Never	28	8.8	17	5.4	0.515	16	5	0.892
1-15 minutes	168	53.0	118	37.2		99	31.2	
16-30 minutes	60	18.9	37	11.7		32	10.1	
>30 minutes	61	19.2	39	12.3		36	11.4	
One arm below shoulder								
Never	54	17.0	31	9.8	0.422	28	8.8.	0.615
1-15 minutes	196	61.8	136	42.9		118	37.2	
16-30 minutes	42	13.2	28	8.8		22	6.9	
>30 minutes	25	7.9	16	5.0		15	4.7	

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Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Arm	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Both arms above shoulder								
Never	74	23.3	44	13.9	0.415	37	11.7	0.615
1-15 minutes	181	57.1	125	39.4		109	34.4	
16-30 minutes	39	12.3	25	7.9		21	6.6	
>30 minutes	23	7.3	17	5.4		15	5.0	
Grasp								
Cylindrical								
Never	45	14.2	26	8.2	0.009*	25	7.9	0.095
1-15 minutes	179	56.5	133	42.0		113	35.6	
16-30 minutes	56	17.7	30	9.5		25	7.9	
>30 minutes	37	11.7	22	6.9		20	6.3	
Hook								
Never	75	23.7	45	14.2	0.508	40	12.6	0.463
1-15 minutes	154	48.6	131	41.3		111	35.0	
16-30 minutes	71	22.4	23	7.3		20	6.3	
>30 minutes	17	5.4	12	3.8		12	3.8	
Tripod grasp								
Never	31	9.8	23	7.3	0.092	20	6.3	0.042*
1-15 minutes	163	51.4	114	36.0		101	31.9	
16-30 minutes	73	23.0	48	15.1		42	13.2	
>30 minutes	50	15.8	26	8.2		20	6.3	

*** means significant, Chi-square test**

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Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Grasp	Workers		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Spherical								
Never	110	34.7	70	22.1	0.705	60	18.9	0.757
1-15 minutes	156	49.2	106	33.4		94	29.7	
16-30 minutes	39	12.3	28	8.8		23	7.3	
>30 minutes	12	3.8	7	2.2		6	1.9	
Leg								
Sit								
Never	29	9.1	23	7.3	0.153	19	6.0	0.166
1-15 minutes	114	36.0	79	24.9		72	22.7	
16-30 minutes	80	25.2	54	17.0		46	14.5	
>30 minutes	94	29.7	55	17.4		46	14.5	
Stand								
Never	16	5.0	11	3.5	0.246	11	3.5	0.174
1-15 minutes	151	47.6	108	34.1		94	29.7	
16-30 minutes	90	28.4	53	16.7		44	13.9	
>30 minutes	60	18.9	39	12.3		34	10.7	
Squat								
Never	72	22.7	45	142	0.248	38	12.0	0.296
1-15 minutes	173	54.6	122	38.5		104	32.8	
16-30 minutes	51	16.0	29	9.1		26	8.2	
>30 minutes	21	6.6	15	4.7		15	4.7	

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Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Leg	Study Population		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Kneeling with one knee								
Never	121	38.2	78	24.6	0.891	66	20.8	0.727
1-15 minutes	121	38.2	94	29.7		81	25.6	
16-30 minutes	62	19.6	29	9.1		27	8.5	
>30 minutes	13	4.1	10	3.2		9	2.8	
Kneeling with both knees								
Never	130	41.0	85	26.8	0.539	71	22.4	0.429
1-15 minutes	132	41.6	92	29.0		80	25.2	
16-30 minutes	35	11.0	20	6.3		18	5.7	
>30 minutes	20	6.3	14	4.4		14	4.4	
Walk								
Never	17	5.4	12	3.8	0.976	10	3.2	0.991
1-15 minutes	135	42.6	90	28.4		78	24.6	
16-30 minutes	73	23.0	49	15.5		43	13.6	
>30 minutes	92	29.0	60	18.9		52	16.4	

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Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Lifted/carried with upright trunk	Study Population		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Light								
Never	61	19.2	30	10.4	0.117	31	9.8	0.653
1-2 times/day	214	67.5	151	47.6		127	40.1	
3-10 times/day	31	9.8	20	6.3		19	6.0	
> 10 times/day	11	3.5	7	2.2		6	1.9	
Medium								
Never	92	29.0	55	17.4	0.324	46	14.5	0.220
1-2 times/day	179	56.5	125	39.4		109	34.4	
3-10 times/day	37	11.7	26	8.2		24	7.6	
> 10 times/day	9	2.8	5	1.6		4	1.3	
Heavy								
Never	152	47.9	101	31.9	0.798	81	25.6	0.390
1-2 times/day	133	42.0	88	27.8		81	25.6	
3-10 times/day	20	6.3	15	4.7		14	4.4	
> 10 times/day	12	3.8	7	2.2		7	2.2	

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Table 11 Duration of work postural and MSDs (n = 317) (cont.)

Lifted/carried with bend down trunk	Study Population		MSDs in past 12 months		P value	MSDs in past 7 days		P value
	n	%	n	%		n	%	
Light								
Never	67	21.1	36	11.4	0.042*	33	10.4	0.205
1-15 minutes	199	62.8	142	44.8		119	37.5	
16-30 minutes	32	10.1	19	6.0		17	5.4	
>30 minutes	19	6.0	14	4.4		14	4.4	
Medium								
Never	103	32.5	59	18.6	0.070	51	16.1	0.062
1-15 minutes	171	53.9	120	37.9		102	32.2	
16-30 minutes	30	9.5	21	6.6		19	6.0	
>30 minutes	13	4.1	11	3.5		11	3.5	
Heavy								
Never	158	49.8	101	31.9	0.693	83	26.3	0.237
1-15 minutes	132	41.6	90	28.4		81	25.6	
16-30 minutes	17	5.4	13	4.1		12	3.8	
>30 minutes	10	3.2	7	2.2		7	2.2	

***means significant, Chi-square test**

Table 12 shown the association between psychosocial and MSDs. The result was the significant difference in changing workplace with MSDs in past 7 day (p = 0.02)

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Table 12 Psychosocial and MSDs (n = 317)

Psychosocial Exposure	n (%)	MSDs in past 12 months		P value	MSDs in past 7 days		P value
		n	%		n	%	
Uninteresting work	67 (21.1)	36	14.5	0.439	42	13.2	0.125
Boring work	32 (10.0)	22	6.9	0.273	20	6.3	0.078
No encouraging organization culture	36 (11.4)	34	7.6	0.923	36	11.4	0.352
No support from superior	66 (20.8)	47	14.8	0.415	44	13.9	0.064
No support from fellow workers	30 (9.4)	20	6.3	0.899	19	6.0	0.326
No support if trouble at work	42 (13.2)	26	8.2	0.509	23	7.2	0.618
Can not control at work	27 (8.6)	19	6.0	0.750	18	5.6	0.469
Can not get the quantitative demand	31 (9.7)	19	6.0	0.514	18	5.7	0.422
Can not get the qualitative demand	29 (9.2)	19	6.0	0.627	18	5.6	0.477
Feel anxiety about change in workplace	83 (26.1)	58	18.3	0.065	55	17.3	0.022*

***means significant, Chi-square test**

4.6 Risk factors of MSDs among maintenance worker in EGAT, Lampang

From the associated between frequency of posture and MSDs in past 12 months and past 7 days can found that trunk slightly flexion, prone, stand, lifted with bend down trunk in the light weight, lifted with upright trunk in light weight were significantly. And in this part would define more sub part in MSDs including neck pain, shoulder pain, elbow pain, upper back pain, lower back pain, wrist pain, hip pain, knee pain, and ankle pain by odd ratio and 95% CI in lower and upper values.

Neck pain, presented in **table 13**, there had risk with significantly with MSDs in past 12 months in trunk slightly flexion (OR=1.959, 0714-5.379), lifted with bend down trunk in medium weight (OR = 2.071, 1.089-3.940) and lifted with bend down trunk in light weight (OR = 2.577, 1.471-4.515). But in past 7 days had only risk without significantly in trunk slightly flexion (OR= 2.312, 0.672-7.957) and stand (OR=2.325, 0.519-10.413).

Table 13 Risk factors of neck pain with frequency of postural (n = 317)

MSDs in past 12 months					
Postural	**Neck Pain**	**Not Neck Pain**	**OR**	**95% CI**	
				Lower	**Upper**
Trunk slightly Flexion	96 (30.3)	196 (61.8)	1.959	0.714	5.379
Prone	63 (19.9)	114 (36.0)	1.483	0.915	2.405
Stand	99(31.2)	201 (63.4)	3.694	0.828	3.694
Lifted with bend down trunk in light weight	87 (27.4)	162 (51.1)	2.071	1.089	3.940
Lifted with bend down trunk in medium weight	81 (25.6)	132 (41.6)	2.577	1.471	4.515
Lifted with upright trunk in light weigh	87 (24.6)	167 (52.7)	1.823	0.954	3.486
MSDs in past 7 Days					
Trunk slightly Flexion	70 (22.1)	222 (70.0)	2.312	0.672	7.957
Stand	71 (13.6)	229 (72.2)	2.325	0.519	10.413

Shoulder pain, there had risk without significantly except lifted with bend down trunk in medium weight (OR = 1.935, 1.108-3.379) with MSDs in past 12 months and 7 days accessible in **table 14**.

Table 14 Risk factors of shoulder pain with frequency of postural (n = 317)

Postural	MSDs in past 12 months				
	Shoulder Pain	Not Shoulder Pain	OR	95% CI	
				Lower	Upper
Trunk slightly Flexion	85 (26.8)	207 (65.3)	1.300	0.502	3.369
Prone	55 (17.4)	122 (38.5)	1.302	0.794	2.136
Stand	88 (27.8)	212 (66.9)	1.937	0.543	6.908
Lifted with bend down trunk in light weight	77 (24.3)	172 (54.3)	1.727	0.905	3.296
Lifted with bend down trunk in medium weight	70 (22.1)	143 (45.1)	1.935	1.108	3.296
Lifted with upright trunk in light weigh	75 (23.7)	179 (56.5)	1.231	0.657	2.307
MSDs in past 7 Days					
Trunk slightly Flexion	72 (22.7)	220 (69.4)	1.036	0.399	2.695
Stand	75 (23.7)	225 (71.0)	1.556	0.435	5.562

Table 15 shown risk factors in frequency postural and upper back pain, there had only risk with no significantly in prone (OR = 1.405, 0.758-2.604), stand (1.464, 0.324-6.607), lifted with bend down trunk in light weight (OR = 2.279, 0.929-5.595), lifted with bend down trunk in medium weight (OR = 1.718, 0.858-3.442) and lifted with upright trunk in light weight (OR = 1.189, 0.545-2.592) in past 12 months. In past 7 days, odd ratio of trunk slightly flexion and stand were 1.036(0.399-2.695) and 2.462(0.318-19.074)

Table 15 Risk factors of upper back pain with frequency of postural (n = 317)

Postural	Upper Back Pain	Not Upper Back Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Prone	32 (10.1)	145 (45.7)	1.405	0.758	2.604
Stand	49 (15.5)	251 (79.2)	1.464	0.324	6.607
Lifted with bend down trunk in light weight	45 (14.2)	204 (64.5)	2.279	0.929	5.595
Lifted with bend down trunk in medium weight	39 (12.3)	174 (54.9)	1.718	0.858	3.442
Lifted with upright trunk in light weigh	42 (13.2)	212 (66.9)	1.189	0.545	2.592
MSDs in past 7 Days					
Trunk slightly Flexion	40 (12.6)	252 (79.5)	3.810	0.501	28.948
Stand	40 (12.6)	260 (82.0)	2.462	0.318	19.074

In **table 16** Most of the postural had risk without significantly except in stand with MSDs in 12 months had no risk. Odd ratio was 0.933 (0.319 - 2.730)

Table 16 Risk factors of lower back pain with frequency of postural (n = 317)

Postural	Lower Back Pain	Not Lower Back Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	86 (27.1)	206 (65)	3.061	0.893	10.498
Prone	57 (18.0)	120 (37.9)	1.603	0.967	2.656
Stand	84 (26.5)	216 (68.1)	0.933	0.319	2.730
Lifted with bend down trunk in light weight	76 (24.0)	173 (54.6)	1.859	0.959	3.603
Lifted with bend down trunk in medium weight	67 (21.1)	146 (46.1)	1.710	0.985	2.972
Lifted with upright trunk in light weigh	75 (23.7)	179 (56.5)	1.466	0.764	2.816
MSDs in past 7 Days					
Trunk slightly Flexion	68 (21.5)	224 (70.7)	3.491	0.803	15.186
Stand	66 (20.8)	234 (73.8)	0.917	0.289	2.905

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In past 12 months, elbow pain, there had only risk with no significantly in prone (OR = 2.238, 1.040-4.816), stand (OR = 1.136, 1.090-1.185), lifted with bend down trunk in light weight (OR = 3.310, 0.983-11.145), lifted with bend down trunk in medium weight (OR = 1.818, 0.797-4.138) and lifted with upright trunk in light weight (OR = 1.613, 0.601-4.330). And in past 7 days, in stand had risk without significant difference (OR = 2.462, 0.318-19.074) that displayed in **table 17**.

Table 17 Risk factors of elbow pain with frequency of postural (n = 317)

Postural	Elbow Pain	Not Elbow Pain	OR	95% CI	
				Lower	Upper
MSDs in past 12 months					
Prone	26 (8.2)	151 (47.6)	2.238	1.040	4.816
Stand	36 (11.4)	264 (83.3)	1.136	1.090	1.185
Lifted with bend down trunk in light weight	33 (10.4)	216 (68.1)	3.310	0.983	11.145
Lifted with bend down trunk in medium weight	28 (8.8)	185 (58.4)	1.818	0.797	4.138
Lifted with upright trunk in light weigh	31 (9.8)	223 (70.3)	1.613	0.601	4.330
MSDs in past 7 Days					
Stand	40 (12.6)	260 (82.0)	2.462	0.318	19.074

Table 18 Wrist pain, presented the unadjusted odd ration and 95%CI (lower, upper). For trunk slightly flexion (OR = 7.568, 1.006-56.953), prone (OR = 2.053, 1.171-3.601), lifted with bend down trunk in medium weight (OR = 2.619, 1.361-5.041), lifted with upright trunk in light weigh (OR = 2.695, 1.169-6.212) were risk with significantly of MSDs in past 12 months. In past 7 days, there had odd ratio in trunk slightly flexion was 7.568(1.006-56.953) and stand was 3.835 (0.498-29.506).

Table 18 Risk factors of wrist pain with frequency of postural (n = 317)

Postural	Wrist Pain	Not Wrist Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	70 (22.1)	222 (70.0)	7.568	1.006	56.953
Prone	49 (15.5)	128 (40.4)	2.053	1.171	3.601
Stand	69 (21.8)	231 (72.9)	2.240	0.500	10.037
Lifted with bend down trunk in light weight	61 (19.2)	188 (59.3)	1.882	0.906	3.907
Lifted with bend down trunk in medium weight	58 (18.3)	155 (48.9)	2.619	1.361	5.041
Lifted with upright trunk in light weigh	64 (20.2)	190 (59.9)	2.695	1.169	6.212
MSDs in past 7 Days					
Trunk slightly Flexion	58 (18.3)	234 (73.8)	5.949	0.788	44.885
Stand	58 (18.3)	242 (76.8)	3.835	0.498	29.506

In **table 19** shown risk factors of hip pain by odd ratio. In slightly flexion (OR = 1.720, 0.390 - 7.593), stand (OR = 1.088, 0.239 - 4.944), lifted with bend down trunk in light weight (OR = 1.331, 0.561 - 3.58), lifted with bend down trunk in medium weight (OR = 1.798, 0.822 - 3.932) had risk but not significantly, except prone had risk with significantly (OR = 2.653, 1.249 - 5.637) in past 12 month. And in the past 7 days had not risk with significant difference in trunk slightly flexion (OR = 1.317, 0.296 – 5.863).

Table 19 Risk factors of hip pain with frequency of postural (n = 317)

	MSDs in past 12 months				
Postural	**Hip Pain**	**Not Hip Pain**	**OR**	**95% CI**	
				Lower	**Upper**
Trunk slightly Flexion	38 (12.0)	254 (80.1)	1.720	0.390	7.593
Prone	30 (9.5)	147 (46.4)	2.653	1.249	5.637
Stand	38 (12.0)	262 (82.6)	1.088	0.239	4.944
Lifted with bend down trunk in light weight	33 (10.4)	216 (68.1)	1.331	0.561	3.158
Lifted with bend down trunk in medium weight	31 (9.8)	182 (57.4)	1.798	0.822	3.932
Lifted with upright trunk in light weigh	32 (10.1)	222 (70.0)	0.991	0.433	2.271
	MSDs in past 7 Days				
Trunk slightly Flexion	30 (9.5)	262 (82.6)	1.317	0.296	5.863
Stand	30 (9.5)	270 (85.2)	0.833	0.182	3.821

In **table 20**, knee pain in past 12 months, prone (OR = 2.156, 1.084 - 4.286) and lifted with bend down trunk in medium weight (OR = 2.523, 1.129 - 5.635) had risk with significantly. Trunk slightly flexion (OR = 0.635, 0.225 - 1.788) and lifted with bend down trunk in light weight (OR = 0.713, 0.346 - 1.496) had not risk with not significantly. And had not risk in trunk slightly flexion in past 7 days (OR = 0.627, 0.174 - 2.253).

Table 20 Risk factors of knee pain with frequency of postural (n = 317)

	MSDs in past 12 months				
	Knee Pain	**Not Knee**		**95% CI**	
Postural		**Pain**	**OR**	**Lower**	**Upper**
Trunk slightly Flexion	40 (12.6)	252 (79.5)	0.635	0.225	1.788
Prone	32 (10.1)	145 (45.7)	2.156	1.084	4.286
Stand	44 (13.9)	256 (80.8)	2.750	0.356	21.265
Lifted with bend down trunk in light weight	33 (10.4)	216 (68.1)	0.713	0.346	1.496
Lifted with bend down trunk in medium weight	37 (11.7)	176 (55.5)	2.523	1.129	5.635
Lifted with upright trunk in light weigh	35 (11.0)	219 (69.1)	0.847	0.394	1.819
	MSDs in past 7 Days				
Trunk slightly Flexion	23 (7.3)	269 (84.9)	0.627	0.174	2.253
Stand	25 (7.9)	275 (86.8)	1.455	0.185	11.428

Ankle pain, every postures in past 12 months, slightly flexion (OR = 6.338, 0.841 - 47.784), prone (OR = 1.780, 0.956 - 3.053), stand (OR = 1.142, 0.318 - 4.105), lifted with bend down trunk in light weight (OR = 1.531, 0.732 - 3.200), lifted with bend down trunk in medium weight (OR = 1.870, 0.978 - 3.576), and lifted with upright trunk in light weight (OR = 1.856,0.834 - 4.132), were risk factors with not significantly. And in past 7 day, slightly flexion had OR = 6.338, 0.841 - 47.784 and stand was OR = 1.358, 0.301 – 6.139 that shown in **table 21**.

Table 21 Risk factors of ankle pain with frequency of postural (n = 317)

Postural	Ankle Pain	Not Ankle Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	61 (19.2)	231 (72.9)	6.338	0.841	47.784
Prone	41 (12.9)	136 (42.9)	1.708	0.956	3.053
Stand	59 (18.6)	241 (76.0)	1.142	0.318	4.105
Lifted with bend down trunk in light weight	52 (18.6)	197 (62.1)	1.531	0.732	3.200
Lifted with bend down trunk in medium weight	48 (15.1)	165 (52.1)	1.870	0.978	3.576
Lifted with upright trunk in light weigh	54 (17.0)	200 (63.1)	1.856	0.834	4.132
MSDs in past 7 Days					
Trunk slightly Flexion	47 (14.8)	245 (77.3)	4.604	0.608	34.868
Stand	46 (14.5)	254 (80.1)	1.358	0.301	6.139

From the significantly difference associated between duration of work postural, trunk slightly flexion, twist, cylindrical, lifted with bend down trunk in light weight and tripod grasp, and MSDs. When used odd ratio > 1 was risk and 95% CI to perform significant difference.

In **table 22** was shown risk factors of neck pain with duration of work posture. Tripod grasp had not risk (OR = 0.846, 0.361-1.980). Other postures had risk without significantly.

Table 22 Risk factors of neck pain with duration of work postural (n = 317)

Postural	Neck Pain	Not Neck Pain	OR	95% CI	
				Lower	Upper
MSDs in past 12 months					
Trunk slightly Flexion	96 (30.3)	197 (62.1)	1.852	0.671	5.109
Twist	89 (28.1)	173 (54.6)	1.853	0.925	3.672
Cylindrical grasp	92 (29.0)	180 (56.8)	2.044	0.944	4.426
Lifted with bend down trunk in light weight	87 (27.4)	163 (51.3)	2.021	1.061	3.847
MSDs in past 7 Days					
Tripod grasp	65 (20.5)	221 (69.7)	0.846	0.361	1.980

In **table 23** Duration of postural was one factor of shoulder pain in trunk slightly flexion (OR = 1.579. 0.571-4.364), cylindrical grasp (OR = 1.288. 0.622-2.668), lifted with bend down trunk in light weight (OR = 1.685. 0.882-3.219) and tripod grasp (OR = 1.402, 0.553-3.554). Twist had the only one risk with significantly (OR = 2.721, 1.232-6.024).

Table 23 Risk factors of shoulder pain with duration of work postural

Postural	Shoulder Pain	Not Shoulder Pain	OR	95% CI	
				Lower	Upper
MSDs in past 12 months					
Trunk slightly Flexion	86 (27.1)	207 (65.3)	1.579	0.571	4.364
Twist	83 (26.2)	179 (56.5)	2.721	1.232	6.024
Cylindrical grasp	80 (25.2)	192 (60.6)	1.288	0.622	2.668
Lifted with bend down trunk in light weight	77 (24.3)	173 (54.6)	1.685	0.882	3.219
MSDs in past 7 Days					
Tripod grasp	72 (22.7)	214 (67.5)	1.402	0.553	3.554

In past 12 months, duration of twist was the risk of upper back pain with significantly (OR = 3.888. 1.165-12.975) that performed in **table 24**.

Table 24 Risk factors of upper back pain with duration of work postural

MSDs in past 12 months					
Postural	**Upper Back Pain**	**Not Upper Back Pain**	**OR**	**95% CI**	
				Lower	**Upper**
Twist	48 (15.1)	214 (67.5)	3.888	1.165	12.975
Cylindrical grasp	48 (15.1)	224 (70.7)	3.000	0.893	10.081
Lifted with bend down trunk in light weight	45 (14.2)	205 (64.7)	2.232	0.909	5.481
MSDs in past 7 Days					
Tripod grasp	39 (12.3)	247 (77.9)	2.289	0.525	9.979

Odd ratio between duration of work postural and low back pain shown risk, trunk slightly flexion (OR = 2.908, 0.845-10.005), twist (OR = 1.943, 0.932-4.048), cylindrical grasp (OR = 1.433, 0.677-3.033), lifted with bend down trunk in light weight (OR = 1.814, 0.935-3.520) and tripod grasp (OR = 1.201, 0.472-3.055) that presented in **table 25**.

Table 25 Risk factors of lower back pain with duration of work postural

Postural	Lower Back Pain	Not Lower Back Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	86 (27.1)	207 (65.3)	2.908	0.845	10.005
Twist	79 (24.9)	183 (57.7)	1.943	0.932	4.048
Cylindrical grasp	79 (24.9)	193 (60.9)	1.433	0.677	3.033
Lifted with bend down trunk in light weight	76 (24.0)	174 (54.9)	1.814	0.935	3.520
MSDs in past 7 Days					
Tripod grasp	64 (20.2)	222 (70.0)	1.201	0.472	3.055

Duration of every postures were risk, but not significantly that were shown in **table 26**. Twist, cylindrical grasp, lifted with bend down trunk in light weight were OR = 3.952 (0.920-16.966), OR = 1.933 (0.567-6.591) and OR = 3.244 (0.963-10.927)

Table 26 Risk factors of elbow pain with duration of work postural

Postural	Elbow Pain	Not Elbow Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Twist	34 (10.7)	228 (71.9)	3.952	0.920	16.966
Cylindrical grasp	33 (10.4)	239 (75.4)	1.933	0.567	6.591
Lifted with bend down trunk in light weight	33 (10.4)	217 (68.5)	3.244	0.963	10.927
MSDs in past 7 Days					
Tripod grasp	30 (9.5)	256 (80.8)	1.094	0.314	3.815

In past 12 months and 7 days were risk with not significantly all of postural, trunk slightly flexion (OR = 1.639, 0.371-7.252), twist (OR = 2.850, 0.846-9.603), cylindrical grasp (OR = 1.433, 0.677-3.033), lifted with bend down trunk in light weight (OR = 1.303, 0.549-3.093) and tripod grasp (OR = 1.053, 0.301-3.680) that presented in **table 27**.

Table 27 Risk factors of hip pain with duration of work postural

	MSDs in past 12 months				
Postural	**Hip Pain**	**Not Hip Pain**	**OR**	**95% CI**	
				Lower	**Upper**
Trunk slightly Flexion	38 (12.0)	255 (80.4)	1.639	0.371	7.252
Twist	37 (11.7)	225 (71.0)	2.850	0.846	9.603
Cylindrical grasp	79 (24.9)	193 (60.9)	1.433	0.677	3.033
Lifted with bend down trunk in light weight	33 (10.4)	217 (68.5)	1.303	0.549	3.093
	MSDs in past 7 Days				
Tripod grasp	29 (9.1)	257 (81.1)	1.053	0.301	3.680

Trunk slightly flexion (OR = 0.601, 0.212-1.700), twist (OR = 0.814, 0.367-1.805), cylindrical grasp (OR = 0.728, 0.315-1.685), lifted with bend down trunk in light weight (OR = 0.697, 0.338-3.815) and tripod grasp (OR = 0.816, 0.230-2.891). There had not risk in duration of work postures among knee pain in past 12 months and 7 days that shown in **table 28**.

Table 28 Risk factors of knee pain with duration of work postural

Postural	Knee Pain	Not Knee Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	40 (12.6)	253 (79.8)	0.601	0.212	1.700
Twist	36 (11.4)	226 (71.3)	0.814	0.367	1.805
Cylindrical grasp	37 (11.7)	235 (74.1)	0.728	0.315	1.685
Lifted with bend down trunk in light weight	33 (10.4)	217 (68.5)	0.697	0.338	1.438
MSDs in past 7 Days					
Tripod grasp	23 (7.3)	263 (83.0)	0.816	0.230	2.891

In table 29, in past 12 months, duration of trunk slightly flexion (OR=6.047, 0.801-45.673), twist (OR = 1.296, 0.597-2.814), lifted with bend down trunk in light weight (OR =1.497, 0.716-3.132) were risk in ankle pain.

Table 29 Risk factors of ankle pain with duration of work postural

Postural	Ankle Pain	Not Ankle Pain	OR	95% CI Lower	95% CI Upper
MSDs in past 12 months					
Trunk slightly Flexion	61 (19.2)	232 (73.2)	6.047	0.801	45.673
Twist	53 (16.7)	209 (65.9)	1.296	0.597	2.814
Cylindrical grasp	53 (16.7)	219 (69.1)	0.968	0.439	2.132
Lifted with bend down trunk in light weight	52 (16.4)	198 (62.5)	1.497	0.716	3.132
MSDs in past 7 Days					
Tripod grasp	40 (12.6)	246 (77.6)	0.467	0.196	1.117

Chapter V
Discussion & Conclusion

5. Discussion

This research aimed to find the prevalence of musculoskeletal disorder symptom in each parts of pain in neck, shoulder, elbow, upper back, lower back, wrist, hip, knee, and ankle in past 12 months and 7 days and also to explore the association between risk factors and musculoskeletal disorder symptom.

In analytical results, this study presented the frequency of data by percentage, mean, and standard deviation, and Chi-Square was used to find the association factors and analysis of Odd ratio with 95% CI to identify the risk factors of musculoskeletal disorder symptom.

5.1 Prevalence of musculoskeletal disorder symptom among maintenance worker in EGAT, Lampang

In the past 12 months for MSDs, the most painful sites were found in neck pain (31.9%), shoulder pain (28.7%), and lower back pain (28.1%). Whereas the previous study in Thai construction-related work (Suda Hanklang, 2012) had the highest incidence in shoulder pain (46.0%), back pain (46.0%), and neck pain (40.1%). In China among factory workers (WenZhou Yu, 2012), the most frequency affected body locations were lower back (28.0%), neck (24.0%) and shoulder (18.6%). Among in the UK oil and gas industry, the result of the measured by Nordic Musculoskeletal Questionnaire the most commonly parts of body were taken together of neck, shoulder and upper back MSDs (Katharine R Parkes MA MSc PhD, 2005). In past of 7 days, construction worker MSDs occurred in elbow (100%), back (90%),hip (61%), wrist and forearm (88%) (Julitta Boschman, 2012) which is different from this study because of difference work tasks. The finding presented MSDs in elbow only 6%, lower back 22.1%, hip (12.6%) and wrist 9.1% that similar percentages of ankle pain among veterinarians (20%) due to the nature of their work and involvement of the long hours of working (Andrew M. Scuffham, 2010).

If compared the difference between MSDs in each body region and severity of pain for example compared neck pain in past 7 day and past 12 months. All body regions had the same direction, MSDs in past 12 months more than 7 days. But in wrist pain had highest difference in 13.3 %. In normally, the small body part as wrist usually use in everyday and it can easier pain more than big body region like shoulder (Marie-Eve Chiassona, Daniel Imbeaua, Judy Majora, Karine Aubrya, & Alain Delisleb, 2015).

5.2 The associated between risk factors and musculoskeletal disorder symptoms

5.2.1 The associated between job characteristics and MSDs

Personal characteristics of participants were significant in educational level associated with MSDs in past 12 months ($p = 0.020$) and MSDs in 7 day ($p = 0.019$). Taiwan workers showed the same result, the education was related to MSDs ($p < 0.01$). High education level was commonly low risk of back pain (How-Ran Guo, 2004). Due to the education is related to the job characteristics. Hence, workers with lower education levels have to work harder and taking risks to the MSD. From the study in Norway, musculoskeletal pain and level of education level, presented a low level of educational level was associated with increased risk of MSD. Generally education can change the personal perception of health, it makes awareness of health and health promotion (Alexander Lal, 2008). In condition of tasks in the workplace, welder and turner had the high risk of MSDs. For example; limitation of work area, repetitive motion, heavy workload and high weigh of tools (Keyserling, 2010).

Others health problem associated with MSDs in past 7 day ($p = 0.034$). Maintenance workers with health problem 38 persons, including gout (15), hypotension (9),dyslipidemia (8), anemia (4) lung cancer (1). The study about health problems lead to considerable productivity loss, found the associated with increased MSDs in industrial worker lead to health problems (W.J. Meerdinga, W. Ijzelenberga, Koopmanschapb, J.L. Severensc, & A. Burdorfa, 2005).

5.2.2 The associated between job characteristics and MSDs

The first job characteristics that significant difference was work area (p = 0.017), including 4 areas, ground area, work in height area, narrow space and confine space. Other was over time (p = 0.012)

Figure 18 Working in narrow space

Figure 18 show the real situation when maintenance worker welding in the narrow area, they were limited of movement (static posture) can compress nerve, reduce blood flow and contribute to muscle fatigue (OSHA, 2000).

Maintenance worker in this study were mostly have over times more than 30 hours/month. It means that they had long duration in each month at least more than 45 hours/month. In the industry can found that risk in work hours/week that 41-45 hours/per had odd ratio 1.42 (1.02-1.96) and p value 0.037 (WenZhou Yu, 2012) that mean long duration of working was risk factor of MSDs.

5.2.3 The associated between work postural and MSDs

The findings found frequency of trunk slightly flexion (p = 0.022), prone (p = 0.011), stand (p= 0.028), lifted/carried with bent down trunk in light weight (p = 0.034), lifted/carried with bend down trunk in medium weight (p = 0.019) and lifted/carried with upright trunk in light weight (p = 0.037) had significant difference with MSDs in past 12 months. And in past 7 day had significantly with trunk slightly flexion (p = 0.012) and stand (p = 0.026).The importance factors related to MSDs were bending

back, carrying and lifting and working with arm above shoulder (Julitta Boschman, 2012) that consistency in this study.

In Australians safety and compensation (council) identified the most hazards inherent in specific work tasks are high duration in the posture; how extreme or awkward. (Australian safety, 2006) that support that duration of work postural may cause of MSDs, in past 12 months the most participants had not associated except trunk slightly flexion ($p = 0.044$), trunk twist ($p = 0.035$), cylindrical grasp ($p = 0.009$), lifted/carried with bend down trunk in light weight ($p = 0.042$). And in past 7 days, there had significant difference in tripod grasp ($p = 0.042$).These physical task factors can directly damage body tissues.

5.2.4 The associated between psychosocial and MSDs

The result in changing workplace was significantly associated with MSDs in past 7 days ($p = 0.02$) towards the consistent significantly increased risk affected who had higher mental stress (OR = 3.16; 95%CI : 2,14-4.32) (WenZhou Yu, 2012). And other finding showed the specific psychosocial factors on the development of MSDs in neck, shoulder, lower back pain. It can be assumed that the experience of psychosocial workplace stressors like changing workplace has an influence on worker' physiological response (Institute for Occupational Medicine & Department of work and social psychology, 2012) and negative psychological perceptions may lead to physical problems (Isabel L. Nunes, 2011).

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5.3 Physical risk factors in body location of MSDs

5.3.1 Neck pain

The postures that may risks with significant difference in neck pain are lifted with bend down trunk in light/medium weight, and trunk slightly flexion. The burden of neck pain had evidence that neck pain is a persistent source, especially in the activity daily living. The prevalence of neck pain depends on the specific task in each job. For the example, worker in industry in Lithuania to 74 %, welders and metal workers in Dutch had 7.8 % of sickness absence related to neck disorder (Pierre 2008). Figure shown the posture in their tasks, welder and turner had the trunk slightly flexion with little flexion neck that may cause of neck pain. Some evidence found that prolong cervical spine period in working may develop the risk.

From the cohort study in Dutch workers informed the similar result that bend down flexion more than 70% seemed to increase neck pain.

Figure 19 Trunk and neck slightly flexion

5.3.2 Shoulder pain

Lifted with bend down trunk in medium weight and trunk slightly flexion (OR = 1.935, 1.108-3.296) had significant difference in shoulder pain. Consistent positive associations in physical work load factors were heavy physical load (awkward postures, including twisted, working with bend down flexed trunk, and working with arms above shoulder level. (DaniëlleAWMvander Windt, 2000)

5.3.3 Lower back pain

Trunk slightly flexion was the high risk in lower back pain (OR = 3.061, 0.893-10.498). Monotonically finding that the trunk flexion over 45 degree risks for high exposure. For lifted or carrying in weight over 10 kilograms was little association with LBP.(J P Jansen, 2004)

5.3.4 Upper back pain

Risk posture of upper back pain was twist (OR = 1.165, 12.975) that consistency in previous study, the worker who worked with the trunk in a minimum of 30degrees of rotation for more than 10% of the working time (RR 1.3, 95% CI 0.9–1.9), 60 degrees of flexion for more than 5% of the working time (RR 1.5, 95% CI 1.0–2.1) (Hoogendoorn, 2000).

5.3.5 Wrist pain

This finding presented the trunk slightly flexion, prone, and lifted with bend down load were risk in wrist. Actually, welder and turner work in many areas, some in the ground, some in the height, and some in confine space. The limit of work area directly to work motion.(Bruce P. Bernard, 1997). Figure17, prone position in narrow space can indirectly risk to elbow pain and wrist pain because of uncomfortable position with limited area and do in the repetitive tasks and the evidence (Bruce P. Bernard, 1997) support shown the risk when lifted or carried in the weigh, in low weight (below 4 kg) was risk (OR = 2.9, P > 0.05).

Figure 20 Prone posture

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5.3.6 Elbow pain

Prone and stand postures were affect to elbow pain. In the other study found the frequency of postures and repetitive task can cause of epicondylitis. Never the less, when worker worked in these two postures with limited motion or repetitive tasks, it can develop elbow pain (Bruce P. Bernard, 1997)

5.3.6 Knee pain

The postural that risk in knee pain was prone and lifted with bend down with load. Work – related factor of knee pain was daily lifting of load and flexion knee. In the similar way, when maintenance worker worked in prone, they have to slightly flexion to welding and increase body balance (H. Miranda, 2002).

6. Conclusion

The aim of this study is to find out the prevalence of musculoskeletal disease among maintenance worker of lignite power plant in Lampang province, Thailand and determine the risk factors that associated with MSDs in past 7 days and 12 months. A cross-sectional study conducted with structured face-to-face interview questionnaire among 317 workers, work in maintenance worker at least 6 months. The prevalence rates of MSDs based on the Nordic Standard Form. Chi-square analysis were used to analyze association between independent and dependent variables with statistical significant of $p < 0.05$ and odds ratio with 95% CI was applied to explore the risk factors of MSDs.

This study was finding as summarize as follow;

6.1 Prevalence of musculoskeletal disorder symptom among maintenance worker in EGAT, Lampang

All of the participating workers, 66.4 % reported MSDs in part 12 months and 57.7 % in past 7 days. The highest body locations were neck pain (31.9%), shoulder pain (28.7%), and lower back pain (28.1%). In the past 7 days, present the most common in MSDs were shoulder pain (24.5%), neck pain (23.0%) and low back pain (22.1%).

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6.2 The associated between risk factors and musculoskeletal disorder symptoms

6.2.1 The associated between personal characteristics and MSDs

Personal characteristics of participants had significant in education level associated with MSDs in past 12 months ($p = 0.020$) and MSDs in 7 day ($p = 0.019$). And other health problems associated in past 7 days ($p = 0.034$).

6.2.2 The associated between job characteristics and MSDs

The first job characteristics that significant difference was work area ($p = 0.017$), including 4 areas, ground area, work in height area, narrow space and confine space. Other was over time ($p = 0.012$).

6.2.3 The associated between work postural and MSDs

The frequency of trunk slightly flexion (p = 0.022), prone (p = 0.011), stand (p = 0.028), lifted/carried with bent down trunk in light weight (p=0.034), lifted/carried with bend down trunk in medium weight (p = 0.019) and lifted/carried with upright trunk in light weight (p = 0.037) had significant difference with MSDs in past 12 months. And in past 7 day had significantly with trunk slightly flexion (p = 0.012) and stand (p = 0.026).

6.2.4 The associated between psychosocial and MSDs

Changing workplace was significantly associated with MSDs in past 7 days (p = 0.02).

6.3 Physical risk factors in body location of MSDs

6.3.1 Neck pain

The postures were risks with significant difference in neck pain are lifted with bend down trunk in light/medium weight, and trunk slightly flexion.

6.3.2 Shoulder pain

Lifted with bend down trunk in medium weight and trunk slightly flexion (OR = 1.935, 1.108-3.296) had significant difference in shoulder pain.

6.3.3 Lower back pain

Trunk slightly flexion was the high risk in lower back pain (OR = 3.061, 0.893-10.498).

6.3.4 Upper back pain

Risk posture of upper back pain was twist (OR = 1.165, 12.975).

6.3.5 Wrist pain

This finding presented the trunk slightly flexion, prone, and lifted with bend down load were risk in wrist pain.

6.3.6 Elbow pain

Prone and stand postures were affect to elbow pain.

6.3.7 Knee pain

The postural that risk in knee pain was prone and lifted with bend down with load.

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7. Recommendation and further study

The management of prevention in musculoskeletal disorder is suggested to include a risk reduction strategy, manager trained to conduct risk assessment including signs & symptoms of MSD, MSD hazard awareness and proper way to report hazards, ergonomics, and support for early intervention. In the working process, considerations of one break in 5-15 minutes cycling time, and improvement of working process through developing materials and reorganizations of workstations to provide sufficient space for movement in each tasks are suggested.

Worker can prevent MSD hazards by ergonomics. The appropriate designing in work place and tools are importance in promotion MSD based on information from task job analysis. And the other way to control risk factors by using (OSHA, 2000);

- Work training, such as correct carrying/lifting techniques
- Administrative controls, such as worker rotation, more task variety, and increased break time.
- Personal protective equipment, such as knee pads, wrist support.
- Stretching muscle during wok such as stretch wrist when had to continue carry tool in the long time.

In the further study can use the prevalence of MSD in maintenance workers in reference and can continue to plan for intervention. And find out the degree in each work postural.

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APPENDICES

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APPENDIX A QUESTIONNAIRE (English version)

Prevalence and risk factors associated with musculoskeletal disorder in maintenance industry workers: A case study of lignite power plant in Lampang province, Thailand

Description: In order to participation in this study, you are required to complete the questionnaire. Questionnaire separated into 5 parts

The details are indicated as following:

Part 1: Personal Characteristics in this part have8 questions.

Part 2: Job Characteristics in this part have 12 questions.

Part 3: Physical work factor in this part have 24 questions.

Part 4: Psychosocial in this part have 10 questions.

Part 5: Standardized Nodic Musculoskletal Questionnaire for Musculoskeletal Symptoms have 9 questions.

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By Miss Chatsuda Mata College of Public Health Science Chulalongkorn University

Part 1: Personal Characteristics

Direction :Please answer by putting a check ✓in the appropriate box ☐ and fill in the answer in the blank space

1. Age _____years

2. Gender ☐ Male ☐Female

3. Weight _____kilograms

4. Height _____centimeters.

5. Education level

☐ Below graduated ☐Bachelor degree ☐Master degree or higher

6. Income

☐ 10,000 – 20,000 Bath ☐ 20,000 – 30,000 Bath ☐ 30,000 – 40,000 Bath

☐ 40,000 – 50,000 Bath ☐ > 50,000 Bath

7. How often do you exercise in 1 week at least 20 minutes/times?

☐Never

☐< 3 times/week

☐≥ 3 times/week

8. Have you ever been drink alcohol before?

☐Drinking nowadays ☐ Drunk in the past ☐ Never drunk

9. Have you ever been smoked cigarette before?

☐Smoking nowadays ☐Smoked in the past ☐ Never smoke

10. Do you have any medical problem?

☐ None ☐Hypertension ☐ Heart disease

☐ Diabetic ☐Other, please specify……...

11. Do you have any leisure?

☐No ☐Yes, please specify…….....

12. Do you have second job or alternative income?

☐No ☐Yes, please specify…….....

Part 2: Personal Characteristics

Direction :Please answer by putting a check ✓ in the appropriate box☐ and fill in the answer in the blank space

1. How long do you work for this industry?

☐1-5 years ☐ 6-10 years ☐10-15 years ☐ > 15 years

2. Do you have the previous position in this industry?

☐No ☐Yes, please specify……

3. How long have you been in maintenance worker?

☐1-5 years ☐6-10 years ☐10-15 years ☐> 15 years

4. What is your job position?

☐ Welder ☐Turner ☐Other, please specify……

5. Where is your work area in one day?

☐ Ground ☐Height area

☐Narrow space ☐Confine space

6. Work duration

6.1 How long have you continue your maintenance work in one session?

☐ 1-5 minutes ☐6-10 minutes ☐ 11-20 minutes

☐21-30 minutes ☐> 30 minutes

6.2 In one day, how many your workload?

☐ 1-5 works ☐6-10 works ☐ >10 works

6.3 In one month, how over time do you have?

☐ 1-10 hours ☐ 11-20 hours

☐ 20-30 hours ☐> 30 hours

7. How long in break time in each session?

☐ 1-10 minutes ☐ 11-20 minutes ☐21-30 minutes ☐>30 minutes

8. Weight of tools during your work session

☐ < 1 kilogram ☐1-5 kilograms

☐ 5-10 kilograms ☐ > 10 kilograms

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Part 3: Physical work factor

Direction :Please answer by putting a check ✓ in the appropriate box

Postural of trunk

Trunk		Frequency	Duration
	**Upright**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Slightly Flexion**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Twist**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Lateral Bend**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Prone**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes

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Postural of arm

Arm		Frequency	Duration
	**Both arms below shoulder**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**One arms above shoulder**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Both arm above shoulder**	1 ☐ Never 2 ☐ 1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes

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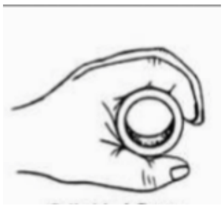
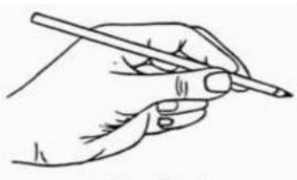
Postural of hand prehension

Grasp	Frequency	Duration
	1 ▢ Never 2 ▢1-2 times/day 3 ▢ 3-10 times/day 4 ▢ >10 times/day	1 ▢1-15 minutes 2 ▢ 16-30 minutes 3 ▢ > 30 minutes
	1 ▢ Never 2 ▢1-2 times/day 3 ▢ 3-10 times/day 4 ▢ >10 times/day	1 ▢1-15 minutes 2 ▢ 16-30 minutes 3 ▢ > 30 minutes
	1 ▢ Never 2 ▢1-2 times/day 3 ▢ 3-10 times/day 4 ▢ >10 times/day	1 ▢1-15 minutes 2 ▢ 16-30 minutes 3 ▢ > 30 minutes
	1 ▢ Never 2 ▢1-2 times/day 3 ▢ 3-10 times/day 4 ▢ >10 times/day	1 ▢1-15 minutes 2 ▢ 16-30 minutes 3 ▢ > 30 minutes

Postural of leg

Leg		Frequency	Duration
	**Sit**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Stand**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Squat**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Kneeling with one leg**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Kneeling with two knees**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Walk**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes

Weight of tools

Lifted/ carried		Frequency	Duration
	**Light (< 2 kg)**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	Medium (2-5 kg)	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	Heavy (>5 kg)	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	**Light (> 2 kg)**	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	Medium (2-5 kg)	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes
	Heavy (>5 kg)	1 ☐ Never 2 ☐1-2 times/day 3 ☐ 3-10 times/day 4 ☐ >10 times/day	1 ☐1-15 minutes 2 ☐ 16-30 minutes 3 ☐ > 30 minutes

Part 4: Psychosocial
Direction :Please answer by putting a check✓ in the appropriate box

Psychosocial Exposure	Strongly Agree	Agree	Disagree	Strongly Disagree
Do you think the maintenance worker is uninteresting job?				
Do you ever feel boring when you work?				
Do you feel that no encouraging organizational culture?				
Do you feel that no support from superior?				
Do you feel that no support from fellow workers?				
Do you feel that no support if trouble at work?				
Do you think that cannot control at work?				
Do you think that cannot get the quantitative demand?				
Do you think that ca not get the qualitative demand?				
Do you feel anxiety about change in workplace?				

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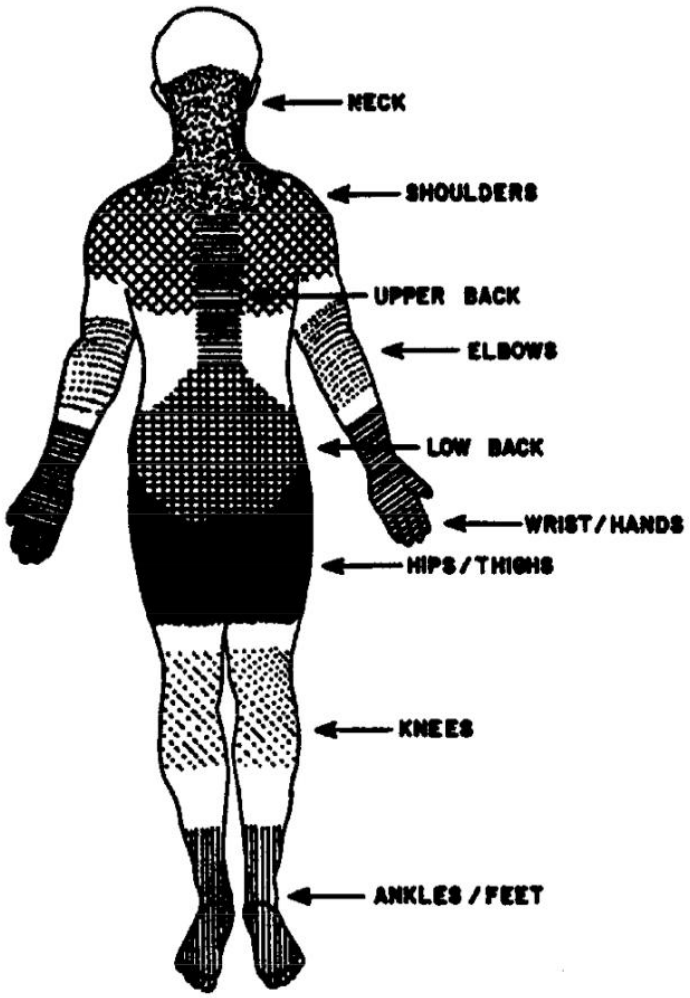
Part 5: Standardized Nodic Musculoskletal Questionnaire for Musculoskeletal Symptoms

Direction: Please answer by putting a cross)x (in the appropriate box – one cross for each question. You may be in doubt as to how to answer, but please do your best anyway. Please answer every question, even if you have never had trouble in any part of your body.



In this picture you can see the approximate position of the parts of the body referred to in the questionnaire. Limits are not sharply defined, and certain parts overlap. You should decide for yourself in which part you have or have had your trouble.

Have you at any time during the last 12 months had trouble (ache, pain, discomfort) in:	**To be answered only by those who Have had trouble**	
	Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?	Have you had trouble at any time during the last 7 days?
Neck 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes
Shoulders 1 □ No 2 □ Yes, In the right shoulder 3 □ Yes, In the left shoulder 4 □ Yes, In both shoulder	1 □ No 2 □ Yes	1 □ No 2 □ Yes
Elbows 1 □ No 2 □ Yes, In the right elbow 3 □ Yes, In the left elbow 4 □ Yes, In both elbow	1 □ No 2 □ Yes	1 □ No 2 □ Yes
Wrists/hand 1 □ No 2 □ Yes, In the wrists/hand 3 □ Yes, In the left wrists/hand 4 □ Yes, In both hand	1 □ No 2 □ Yes	1 □ No 2 □ Yes
Upper back 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes
Low back (small of the back) 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes
One or both hips/thighs 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes
One or both knees 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes
One or both ankles/feet 1 □ No 2 □ Yes	1 □ No 2 □ Yes	1 □ No 2 □ Yes

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APPENDIX B QUESTIONNAIRE (Thai version)

แบบสอบถาม ความชุกและปัจจัยเสี่ยงที่เกี่ยวข้องกับความผิดปกติของกล้ามเนื้อและโครงกระดูก ในช่างซ่อมบำรุงโรงงานอุตสาหกรรม : กรณีศึกษาโรงไฟฟ้าถ่านหินลิกไนต์ จังหวัดลำปาง ประเทศไทย

คำอธิบาย

กรุณาตอบคำถามต่อไปนี้ เพื่อใช้เป็นแนวทางในการศึกษา โดยแบบสอบถามมีจำนวน 63 ข้อ แบ่งออกเป็น 5 ส่วน ซึ่งมีรายละเอียดดังต่อไปนี้

ส่วนที่ 1 : คุณสมบัติเฉพาะบุคคล จำนวน 8 ข้อ

ส่วนที่ 2 : คุณสมบัติเฉพาะของงาน จำนวน 12 ข้อ

ส่วนที่ 3 : ท่าทางทางกายภาพในการทำงาน จำนวน 24 ข้อ

ส่วนที่ 4 : ลักษณะทางจิตใจในสังคม จำนวน 10 ข้อ

ส่วนที่ 5 : คำถามเฉพาะเกี่ยวกับความผิดปกติของกล้ามเนื้อและโครงกระดูก จำนวน 9 ข้อ

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โดย นางสาวฉัตรสุดา มาทา วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ขอขอบพระคุณผู้ตอบแบบสอบถามที่ให้ความร่วมมือเป็นอย่างดี

ส่วนที่ 1 : คุณสมบัติเฉพาะบุคคล

คำอธิบาย : กรุณาตอบแบบสอบถามโดยใช้เครื่องหมายถูก ✓ ในช่อง☐ ต้องการเลือก และเขียนคำตอบในช่องว่าง

1. อายุ _____ปี

2. เพศ ☐ ชาย ☐หญิง

3. น้ำหนัก _____กิโลกรัม

4. ส่วนสูง _____เซนติเมตร

5. ระดับการศึกษา

☐ ระดับต่ำกว่าปริญญาตรี ☐ระดับปริญญาตรี ☐ระดับปริญญาโทหรือสูงกว่า

6. รายได้ต่อเดือน

☐ 10,000 -20,000 บาท ☐ 20,000 - 30,000 บาท ☐ 30,000 – 40,000 บาท

☐ 40,000 – 50,000 บาท ☐ 50,000 บาทขึ้นไป

7. ใน นาทีต่อครั้งบ่อยแค่ไหน 20 สัปดาห์ ท่านออกกำลังกายอย่างต่อเนื่องอย่างน้อย 1

☐ไม่เคย

☐น้อยกว่า 3 ครั้ง/สัปดาห์

☐มากกว่าหรือเท่ากับ 3 ครั้ง/สัปดาห์

8. ท่านดื่มเครื่องดื่มแอลกอฮอล์หรือไม่

☐ดื่มอยู่ในปัจจุบัน ☐เคยดื่มแต่ปัจจุบันเลิกดื่มแล้ว ☐ไม่เคยดื่ม

9. ท่านสูบบุหรี่หรือไม่

☐สูบอยู่ในปัจจุบัน ☐เคยสูบ แต่ปัจจุบันเลิกแล้ว ☐ไม่เคยสูบ

10. ท่านมีโรคประจำตัวหรือไม่

☐ ไม่มี ☐ความดันโลหิตสูง ☐ โรคหัวใจ

☐ โรคเบาหวาน ☐อื่นๆ โปรดระบุ……..

11. ท่านมีงานอดิเรกหรือไม่

☐ไม่มี ☐ มี โปรดระบุ……

12. ท่านมีอาชีพเสริมอื่น นอกเหนือจากงานที่ทำอยู่ในปัจจุบันหรือไม่

☐ไม่มี ☐มี โปรดระบุ……..

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ส่วนที่ 2 : คุณลักษณะเฉพาะของงาน

คำอธิบาย: กรุณาตอบแบบสอบถามโดยใช้เครื่องหมายถูก ✓ ในช่อง☐ ต้องการเลือก และเขียนคำตอบในช่องว่าง

1. ท่านทำงานในโรงงานนี้เป็นระยะเวลา

☐ 1-5 ปี ☐6-10 ปี ☐10-15 ปี ☐15 ปีขึ้นไป

2. ท่านเคยทำงานอยู่ในตำแหน่งอื่น นอกเหนือจากตำแหน่งช่างซ่อมบำรุงหรือไม่

☐ ไม่เคย ☐ เคย โปรดระบุ……..

3. ท่านทำงานอยู่ในตำแหน่งช่างซ่อมบำรุงเป็นระยะเวลา

☐ 1-5 ปี ☐ 6-10 ปี ☐10-15 ปี ☐15 ปีขึ้นไป

4. ท่านทำงานในตำแหน่งงานย่อยใดในช่างซ่อมบำรุง

☐ ช่างเชื่อม ☐ช่างประกอบ ☐ อื่นๆ โปรดระบุ……..

5. ใน 1 วัน ท่านทำงานส่วนใหญ่ที่บริเวณใด

☐ บนพื้นดิน ☐บนที่สูง กระเช้า,นั่งร้าน,บันได

☐ พื้นที่คับแคบ ☐ พื้นที่อับอากาศ

6. ระยะเวลาในการทำงาน

6.1 ระยะเวลาต่อ งานที่ท่านต้องทำหน้าที่ซ่อมบำรุงอย่างต่อเนื่อง

☐ 1-5 นาที ☐6-10 นาที ☐ 11-20 นาที

☐21-30 นาที ☐> 30 นาที

6.2 ในหนึ่งวันท่านทำงานซ่อมบำรุงประมาณกี่ชิ้นงาน

☐ 1-5 ชิ้น ☐6-10 ชิ้น ☐ >10 ชิ้นขึ้นไป

6.3 ในหนึ่งเดือนท่านทำงานล่วงเวลาประมาณกี่ชั่วโมง

☐ 1-10 ชั่วโมง ☐ 11-20 ชั่วโมง

☐ 20-30 ชั่วโมง ☐> 30 ชั่วโมงขึ้นไป

7. ระยะเวลาในการพักระหว่างทำงานซ่อมบำรุง

☐ 1-10 นาที ☐11-20 นาที ☐21-30 นาที ☐>30 นาที

8. น้ำหนักของอุปกรณ์ส่วนใหญ่ที่ท่านถือขณะทำงานซ่อมบำรุง

☐ น้อยกว่า 1 กิโลกรัม ☐1-5 กิโลกรัม

☐ 5-10 กิโลกรัม ☐ > 10 กิโลกรัม

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ส่วนที่ 3 : ท่าทางทางกายภาพในการทำงาน

คำอธิบาย : โปรดระบุความถี่ของท่าทางในการทำงานและเวลาในการทำท่าทางอย่างต่อเนื่องในแต่ละครั้ง โดยทำเครื่องหมายถูก ในช่องที่ต้องการเลือก

ส่วนลำตัว

ท่าทางในการทำงาน		ความถี่ในการทำท่าทาง	เวลาในการทำท่าทางต่อเนื่องในแต่ละครั้ง
	ยืนตัวตรง	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	ก้มตัว	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	บิดตัว, เอี้ยวตัว	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	เอียงตัวไป ด้านข้าง	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	นอน	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที

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ส่วนแขน

ท่าทางในการทำงาน		ความถี่ในการทำท่าทาง	เวลาในการทำท่าทางต่อเนื่องในแต่ละครั้ง
	แขนทั้งสองข้างอยู่ต่ำกว่าระดับไหล่	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	แขน 1 ข้างอยู่เหนือกว่าระดับไหล่	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	แขนทั้งสองข้างอยู่สูงกว่าระดับไหล่	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที

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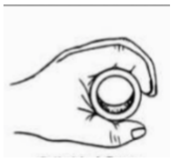
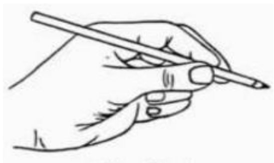
การจับ

ท่าทางในการทำงาน	ความถี่ในการทำท่าทาง	เวลาในการทำท่าทางต่อเนื่องในแต่ละครั้ง
	1 ☐ ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	1 ☐ ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	1 ☐ ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	1 ☐ ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที

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ส่วนขา

ท่าทางในการทำงาน		ความถี่ในการทำท่าทาง	เวลาในการทำท่าทางต่อเนื่องในแต่ละครั้ง
	นั่ง	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	ยืน	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	นั่งยองๆ	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	นั่งคุกเข่า ข้างเดียว	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	นั่งคุกเข่า สองข้าง	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	เดินหรือ เคลื่อนไหว ร่างกาย	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที

น้ำหนักของที่ถือ

ท่าทางในการยกหรือถือของ		**ความถี่ในการทำท่าทาง (ครั้ง/วัน)**	**เวลาในการทำท่าทางต่อเนื่องแต่ละครั้ง(นาที)**
 ท่าก้มตัว	เบา (น้อยกว่า 2 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	ปานกลาง (2 – 5 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	หนัก(มากกว่า 5 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
 ท่าหลังตรง	เบา (น้อยกว่า 2 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	ปานกลาง (2 – 5 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที
	หนัก(มากกว่า 5 กิโลกรัม)	1 ☐ไม่เคย 2 ☐ 1-2 ครั้ง/วัน 3 ☐ 3-10 ครั้ง/วัน 4 ☐ >10 ครั้ง/วัน	1 ☐ 1-15 นาที 2 ☐ 16-30 นาที 3 ☐ > 30 นาที

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ส่วนที่ 4 : ลักษณะทางจิตใจในสังคม

คำอธิบาย : กรุณาทำเครื่องหมายถูก ✓ ในช่องที่ต้องการเลือก

คำถาม	เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
ท่านคิดว่างานซ่อมบำรุงเป็นงานที่ไม่น่าสนใจ				
ท่านเคยรู้สึกเบื่อขณะทำงานซ่อมบำรุง				
ท่านรู้สึกไม่มีกำลังใจในการทำงานในโรงงานแห่งนี้				
ท่านรู้สึกว่าไม่ได้รับการดูแลจากผู้บังคับบัญชา				
ท่านรู้สึกว่าไม่ได้รับการดูแลจากเพื่อนร่วมงาน				
ท่านรู้สึกไม่ได้รับการดูแลเมื่อเกิดปัญหาในที่ทำงาน				
ท่านคิดว่าท่านไม่สามารถควบคุมการทำงานของตนเองได้				
ท่านคิดว่าท่านไม่สามารถทำงานได้ตามปริมาณงานที่ตั้งเป้าหมายไว้				
ท่านคิดว่าท่านไม่สามารถทำงานอย่างมีคุณภาพตามที่ตั้งเป้าหมายไว้				
ท่านรู้สึกกังวลเมื่อต้องเปลี่ยนสถานที่ทำงาน				

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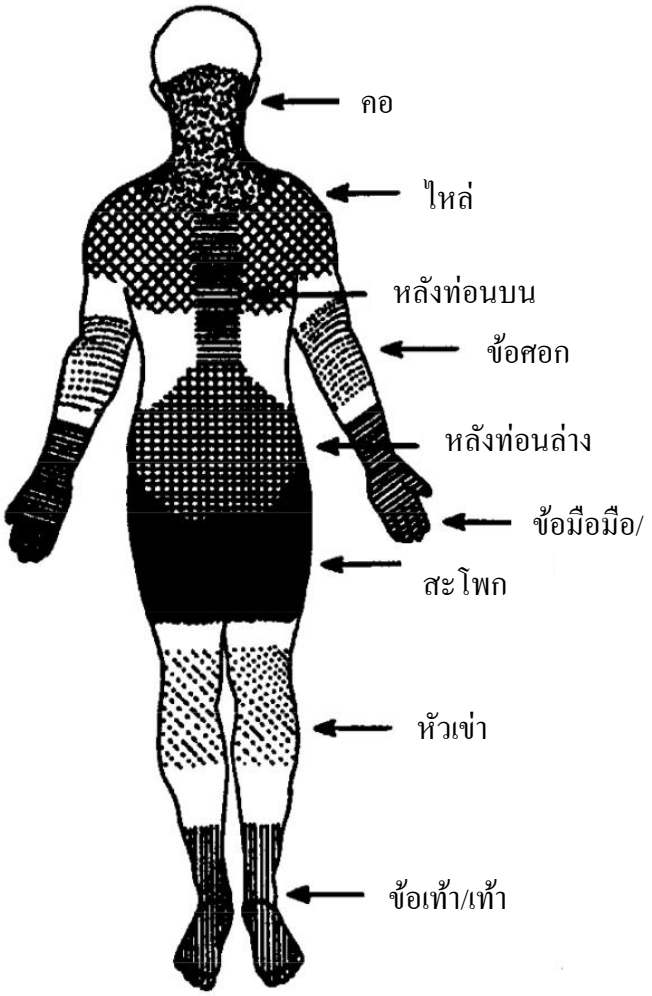
ส่วนที่ 5 : คำถามเฉพาะเกี่ยวกับความผิดปกติของกล้ามเนื้อและโครงกระดูกมีทั้งหมด 27 ข้อ

คำอธิบาย : กรุณาตอบแบบสอบถามโดยใช้เครื่องหมายถูก✓ ในช่องที่เลือก โดยในหนึ่งข้อสามารถตอบได้เพียงหนึ่งคำตอบ และกรุณาทำแบบสอบถามทุกข้อ



ภาพข้างต้นแสดงตำแหน่งส่วนของร่างกายที่แบบสอบถามอ้างอิงถึงในกรณีที่ส่วนของร่างกายอาจซ้ำซ้อนกันคุณสามารถระบุตำแหน่งได้ด้วยตนเอง

ใน 1 ปีที่ผ่านมาท่านเคยมีอาการเจ็บปวดตามส่วนต่างๆของร่างกายเหล่านี้ หรือไม่	**ตอบในกรณีที่มีอาการเจ็บปวด**	
	ในช่วง 1 ปีที่ผ่านมา ท่านเคยไปพบแพทย์เนื่องจากอาการเจ็บปวดตามส่วนต่างๆของร่างกายเหล่านี้หรือไม่	ในระยะ 7 วันที่ผ่านมา ท่านมีอาการเจ็บปวดตามส่วนต่างๆของร่างกายเหล่านี้หรือไม่
คอ 1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่
ไหล่ 1 □ไม่ 2 □ใช่ ในไหล่ข้างขวา 3 □ใช่ ในไหล่ข้างซ้าย 4 □ใช่ ในไหล่ทั้งสองข้าง	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่ ในไหล่ข้างขวา 3 □ใช่ ในไหล่ข้างซ้าย 4 □ใช่ ในไหล่ทั้งสองข้าง
ข้อศอก 1 □ไม่ 2 □ใช่ในข้อศอกข้างขวา 3 □ใช่ในข้อศอกข้างซ้าย 4 □ใช่ในข้อศอกทั้งสองข้าง	1 □ไม่ 2□ใช่	1 □ไม่ 2 □ใช่ในข้อศอกข้างขวา 3 □ใช่ในข้อศอกข้างซ้าย 4 □ใช่ในข้อศอกทั้งสองข้าง
ข้อมือ/มือ 1 □ไม่ 2 □ใช่ในข้อมือ/มือ ข้างขวา 3 □ใช่ในข้อมือ/มือ ข้างซ้าย 4 □ใช่ในข้อมือ/ มือ ทั้งสองข้าง	1 □ ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่ในข้อมือ/มือ ข้างขวา 3 □ใช่ในข้อมือ/มือ ข้างซ้าย 4 □ใช่ในข้อมือ/ มือ ทั้งสองข้าง
หลังท่อนบน 1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่
หลังท่อนล่าง 1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่
สะโพก 1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่
ข้อเข่า 1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่
ข้อเท้า/เท้า 1 □ไม่ 2 □ใช่ในข้อเท้า/เท้า ข้างขวา 3 □ใช่ในข้อเท้า/เท้า ข้างซ้าย 4 □ใช่ในข้อเท้า/เท้า ทั้งสองข้าง	1 □ไม่ 2 □ใช่	1 □ไม่ 2 □ใช่ในข้อเท้า/เท้า ข้างขวา 3 □ใช่ในข้อเท้า/เท้า ข้างซ้าย 4 □ใช่ในข้อเท้า/เท้า ทั้งสองข้าง

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APPENDIX C ETHICAL APPROVEL FOR THE STUDY

AF 01-12

คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย
254 อาคารจามจุรี 1 ชั้น 2 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330
โทรศัพท์/โทรสาร: 0-2218-3202 E-mail: eccu@chula.ac.th

COA No. 112/2558

ใบรับรองโครงการวิจัย

โครงการวิจัยที่ 071.1/58 : ความชุกและปัจจัยเสี่ยงที่เกี่ยวข้องกับความผิดปกติของกล้ามเนื้อและโครงกระดูกในช่างซ่อมบำรุงโรงงานอุตสาหกรรม: กรณีศึกษาโรงไฟฟ้าถ่านหินลิกไนต์ จังหวัดลำปาง ประเทศไทย

ผู้วิจัยหลัก : นางสาวฉัตรสุดา มาทา

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 พฤษภาคม 2558 **วันหมดอายุ** : 25 พฤษภาคม 2559

เอกสารที่คณะกรรมการรับรอง

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

เลขที่โครงการวิจัย 071.1/58
วันที่รับรอง 26 พ.ค. 2558
วันหมดอายุ 25 พ.ค. 2559

เงื่อนไข

1. ข้าพเจ้ารับทราบว่าเป็นการผิดจริยธรรม หากดำเนินการเก็บข้อมูลการวิจัยก่อนได้รับการอนุมัติจากคณะกรรมการพิจารณาจริยธรรมการวิจัยฯ
2. หากใบรับรองโครงการวิจัยหมดอายุ การดำเนินการวิจัยต้องชุดิ 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 D FREQUENCY OF PSYCHOSOCIAL EXPOSURE

Psychosocial Exposure	Level (n%)			
	Strongly Agree	Agree	Disagree	Strongly agree
Uninteresting work	21(6.6)	46(14.5)	123(38.8)	127(40.1)
Boring work	3 (0.9)	29 (9.1)	185 (58.4)	100 (31.5)
No encouraging organization culture	10 (3.2)	26 (8.2)	157 (49.5)	124 (39.1)
No support from superior	8 (2.5)	58 (18.3)	170 (53.6)	81 (25.6)
No support from fellow workers	3 (0.9)	27 (8.5)	191 (60.3)	96 (30.3)
No support if trouble at work	7 (2.2)	35 (11.0)	182 (57.4)	93 (29.3)
Can not control at work	4 (1.3)	23 (7.3)	179 (56.5)	111 (35.0)
Can not get the quantitative demand	8 (2.5)	23 (7.2)	192 (60.4)	94 (29.6)
Can not get the qualitative demand	4 (1.3)	25 (7.9)	175 (55.2)	113 (35.6)
Feel anxiety about change in workplace	16(5.0)	67 (21.1)	164 (51.7)	70 (22.1)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

AFFENDIX E WORK PLACE

Mae Moh EGAT, Lampang provience

VITA

Ms. Chatsuda Mata was born on the 26 October, 1990 in Lampang Province, Thailand. She received a Bachelor of Sciences in Occupational Therapy in 2013 from Mahidol University, Thailand. After graduated she worked as occupational therapy in Manarom hospital. She continued her study for a Master of Public Health in Environmental and occupational health, Chulalongkorn University, Thailand, in 2014 and completed the program in 2015.