# การทบทวนวรรณกรรมเกี่ยวกับการจัดการด้านการยศาสตร์ในการป้องกันอาการผิดปกติของระบบกระดูกและกล้ามเนื้อในการทำงาน

## The Literature Review On The Ergonomic Management Prevention Of Musculoskeletal Disorders In Workplace

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**บทคัดย่อ**

การศึกษาครั้งนี้เป็นการทบทวนวรรณกรรมอย่างเป็นระบบและมีวัตถุประสงค์คือ เพื่อสรุปความรู้เกี่ยวกับการศึกษาการจัดการด้านการยศาสตร์ในการป้องกันอาการผิดปกติของระบบกระดูกและกล้ามเนื้อจากการทำงาน ข้อมูลได้จากการศึกษาค้นคว้างานวิจัย บทความจากสื่ออิเล็กทรอนิกส์ ห้องสมุด จำนวน 10 ฉบับ ตั้งแต่ปี พ.ศ. 2554 – 2560 ผลการศึกษาการจัดการด้านการยศาสตร์ในการป้องกันอาการผิดปกติของระบบกระดูกและกล้ามเนื้อจากการทำงาน พบว่า การออกแบบสถานีงานที่ถูกต้องเหมาะสมสามารถลดความเมื่อยล้าของกล้ามเนื้อได้ และสามารถเพิ่มผลผลิตของงานที่ทำ และสร้างความพึงพอใจให้กับพนักงานได้ในระดับมาก รวมถึงมาตรฐานด้านความปลอดภัยช่วยให้การดำเนินงานด้านการยศาสตร์ในการทำงานมีประสิทธิภาพมากขึ้น แต่อย่างไรก็ตาม ในการศึกษานี้พบว่าการดำเนินงานด้านการยศาสตร์แบบมีส่วนร่วมยังคงต้องพัฒนาต่อไป

**คำสำคัญ :** การป้องกันอันตรายจากการทำงาน / การดำเนินการ / ความผิดปกติของระบบกระดูกและกล้ามเนื้อ

**Abstract**

This study was a systematic review and the purpose of this study was to conclude knowledge about education pertain the study of ergonomics management protect of musculoskeletal disorders from working. The samples were 10 studies of published research from electronic media, libraries literature during 2010 to 2017, Data and characteristics of the studies were collected by an instrument developed based on a literature review. Results of the study of the study of ergonomics management protect of musculoskeletal from working. Found workstation design reduces muscle fatigue and increases productivity and the satisfaction of the officers is also in the high level. Including safety standards It contributes to the ergonomic operation more effectively. But. Participatory ergonomics. Still need to be developed in this study.

**Keywords :** prevention workplace hazards. / Implementation. / musculoskeletal disorders.

## 1. Introduction

Occupational loss events continue to cripple the productivity and livelihood of employers on a global scale. According to 2015 data from the United States Bureau of Labor Statistics 2016,[(1)] 4,836 American workers were killed while performing their work duties, equating to thirteen worker deaths every day, and another estimated 50,000 died during the same timeframe from occupational diseases. The annual financial cost of occupational injuries and illnesses is valued at a staggering $250 billion.[(2)] Globally, over 6,300 people die each day from occupational-related loss incidents or diseases – nearly 2.3 million deaths each year, or one international occupational fatality everysecond[(3),(4)] Moreover, this figure does not include the approximately 300 million non-fatal workplace loss incidents recorded worldwide each year.(3) In the United States alone, over four million workers suffer a serious illness or injury every year, resulting in over 26 million lost working days.[(5)] Ergonomic losses achieve recognition as the leading non-fatal occupational injury category,

accumulating a projected loss total of $15-45 billion annually. [6] In 2013, the United State Bureau of Labor Statistics (BLS) reported musculoskeletal disorders (MSD) cases accounted for 33 percent of all worker injury and illness cases in the United State.[7]

Musculoskeletal system disorders. The outline is an illness which is found in almost every occupational group. And it is the leading cause of injury, including lead. To the absence of sickness As a result of the yield. Decreased functionality.[8] From the problem. It has both economic and social impacts. By Health Safety Executive of the United Kingdom. It is estimated that there will be people in England each year. 1.01 million people suffer from abnormal muscular disorders. And skeletal And each sick person must stop. Average guest stay 20.5 days Patients and establishments.[9]

Ergonomics - "Ergonomics is the scientific study of people at work. The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks. This is accomplished by designing tasks, work spaces, controls, displays, tools, lighting, and equipment to fit the employee´s physical capabilities and limitations."[10]

From the above Researchers are interested in bringing about the research study the study of ergonomics management protect of musculoskeletal disorders from working. To get a reasonable empirical evidence helpful in finding ways to prevent.

## 2. Objectives of the study

To conclude knowledge about education pertain the study of ergonomics management protect of musculoskeletal disorders from working.

## 3. Methodology

The study population : Research studies abroad the study of ergonomics management

protect of musculoskeletal disorders from working. In literature during 2010 to 2017. By search the research report follows.

1. Keywords : Ergonomics management, prevention workplace hazards, implementation, musculoskeletal disorders

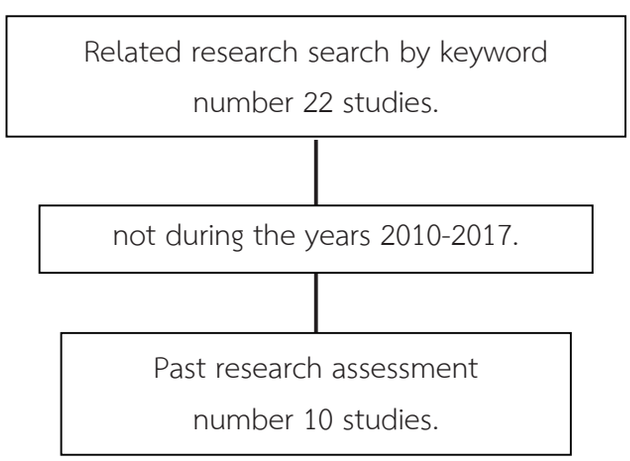
2. Determine the source of information : CINAHL, Pub Med, ProQuest Dissertation, Science Direct

3. Synthetic Overview The research report. And results were analyzed by descriptive content.

4. The proposed review of the literature. The discussion. Comments and suggestions. Approach to further research.

**The instrument used for data collection :** Author form study design, thinking framework, Sample, Factors such studies, The results, level information, The agency m ade the study, published year

**Selection Research**




## 4. Results

Review of the research report shown the study of ergonomics management protect of musculoskeletal disorders from working. details shown in Table 1.

**Table 1.** Research involving Review of the research reported the study of ergonomics management protect of musculoskeletal disorders from working in Thailand.

**details Table 1.**

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| 1. Kanokwan Punkub (2010) [11] | Work Station Improvement for Muscular Fatigue Reduction among Female Operators in Handicraft Mulberry Paper. | A quasi-experimental research. Assess muscle fatigue with a questionnaire. And measure muscle fatigue with Electromyography (EMG.) And improved the workstation by providing the new design which is suitable to the physical bodies of the worker. | It was found that the fatigue feeling of general body, deltoideus muscle and erector spinae muscle during workingat improved workstation were lower than the existing one, by questionnaire evaluation, while the muscular fatigue of deltoideus muscle and erector spinae muscles during working at improved workstation were less than the existing one, by Electromyography (EMG) measuring. |
| 2. Sawitree Chudkratok , Sudaw Lertwisuttipaiboon, Sarisak Soontornchai (2011) [12] | The Workstation Design of the Returning Product Inspection Officers By Using Ergonomic Principle. | This experimental research. Inspection section by comparing data before and after redesigning the workstations. | The average abnormality index statistic has significantly decreased after the redesign.($p < 0.001$) The Rapid Upper Limb Assessment statistic has significantly decreased after the redesign.($p < 0.001$) Lastly, the sitars electromyographystatistic has also significantly decreased after the redesign ($p< 0.001$). |
| 3. Angoon Sungkhapon, Klangduen Pochana, Worapon Auesujaridwong (2013) [13] | Workstation Improvement for Risk Reduction of Muscular Fatigue Among Production Workers in Tuna Manufacturing Process: A Case Study of a Seafood Processing Factory | A quasi - experimental research. The steps for this research were divided into 3 steps. Evaluation of working postures and muscular fatigueproblems by using Rapid Upper Limp Assessment (RULA), biomechanics and EMG in existent and improved conditions. | The result of this research revealed that average Rapid Upper Limp Assessment (RULA) scores at improved workstation and average compressive and shear force on intervertebral disc L5/S1 at improved workstation were decreased. In addition, the mean frequencies of erector spinae muscle, trapezius muscle and anterior deltoid muscle of workers were less than those on existent condition. Finally, it was found that the proposed workstation could increase the productivity by 1.17 kilogram per man-hour with the payback period of investment was about six months. |

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| 4. Chantana Chantawong, Nisakorn Krungkraipetch, Yupa Dawreuang (2016) [14] | Participatory ergonomics intervention to reduce risk factors of work related musculoskeletal disorders in smoked rubber plant, Rayong Province | Participatory Action Research. The samples were 1 administrator, 7 supervisors, 80 workers. | The ergonomic team, the staff, and the research team well participated throughout the entire processes. The results showed that mean scores of knowledge and awareness have significantly increased after the intervention, (t=4.543, p-value <.001)and (t=13.877, p-value <.001). There were some posture risk reductions of 11 activities out of 18 activities (61.0 percent) and significantly reduce musculoskeletal pain severity during the last 7 days (t=8.891, p-value <.001). Particularly, risk levels of separate rubber sheet above chest level, at waist level and clipping out foreign matter activities were reduce from high to moderate levels. |
| 5. Suwat Chamnan, Natchaporn Pichainarong, Ronnaruth Butsaenkom, (2016) [15] | The results of ergonomics health promotion program for behavioral modification of work-related muscuroskeletal disorders risk reduction among Srisomdet hospital personnel, Srisomdet district, Roi Et province. | A quasi - experimental research was to examine the results of ergonomic health promotion program to impove health behavior for preventing the risk of Musculoskeletal disorders. The Paticipants were divided into 2 groups as 40 people for experimental group and 40 people | The results revealed that the experimental group showed the gains in the mean scores of the risk, violence of perception, advantage and disadvantage of the prevention of musculoskeletal disorder, action from before the experiment. Also the leval of fatigue, muscle skeletal pain of the experimental group was both lower than the experiment and lower than the comparison group (p<0.001). |
| 6. Ratchanee Joomjee, Onanong Bureelerd, Nopparat Songserm, Chalermsiri Theppitak (2017) [16] | The Study of Ergonomic Management for Reduce Musculoskeletal Symptoms among the Para-Rubber Farmer. | Research Methodology is a descriptive and quasi-experimental research. | The results of the study showed that most of the farmers got pain around their lower back, knees, hip, thigh, hand/wrist, shoulder, calf, lower arm, upper arm, back, neck, elbow, respectively. The |

**Table 2.** Research involving Review of the research report find the study of ergonomics management protect of musculoskeletal disorders from working abroad.

**details Table 2.**

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| 7. Derek Matthew Ross (2010) [17] | Redesigning a Tire Palletizing Operation: Implementation of an Ergonomic Design Methodology. | A three phase, mixedmethods approach was used to conduct this study. | The results appear to demonstrate a musculoskeletal risk associated with this palletizing task, which is supported by the Rapid Entire Body Assessment (REBA) biomechanical risk assessment. In addition, there appears to be moderate levels of fatigue associated with this task, primarily in the shoulders, back and arms, which was determined by the Rodgers Muscular Fatigue assessment tool. Supporting this observation, the Michelin injury data for this task indicates that the majority of injuries also occur to the shoulders and back. Paul Doucette reports that approximately 50 percent of all injuries on this work post are back injuries, 30 percent are shoulder injuries and the remaining 20 percent are attributed to the remaining body segments, slips, trips and falls. Michelin management personnel also report high levels of absenteeism and worker turnover. |

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| 8. Robert G. Batson (2012) [18] | Masonry Construction Recognizing & Controlling Ergonomic Hazards. | A article | Ergonomic hazards encountered daily by masons and mason tenders. It surveyed recent research and development activities in the United States and other countries to demonstrate that a wide variety of engineering, work practice and administrative controls are available as countermeasures to masonry ergonomic hazards.As noted, barriers to dissemination of research findings and implementation of appropriate controls, include:<br>1) lack of awareness of the severity of the problem and availability of multiple control options;<br>2) lack of training materials from any source government agencies, industry groups, larger contractors, universities or colleges;<br>3) the decentralized nature of the industry and prevalence of numerous, small business contractors in each state;<br>4) small businessperson skepticism that the ergonomics problem affects his/her workers, hence the very existence of his/her firm, and that inexpensive training and control practices are available. |
| 9. Walter G. Rostykus, Winnie Ip and Jennifer Ann Dustin. (2016) [19] | Managing Ergonomics Applying ISO 45001 as a Model. | A article | Effective Implementation.<br>1) Assess the current ergonomics program/ process based on a management system model; the current company safety, engineering, quality, training and/or recordkeeping standards; the business and safety goals and standards; and industry best practices. |

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| | | | 2) Define the common goal, measures, requirements, roles and responsibilities, and commontools in a foundation document on which all department and site ergonomic improvement processes are based.<br>3) Get buy-in, sponsorship and engagement from top leaders. Their visible interest and involvement will drive the ergonomic improvement processdownward through the organization.<br>4) Implement the ergonomic improvement process at each location or department through the sponsor, subject matter experts and engineers. Ensure that they use common assessment tools for consistent reporting and tracking, and share effective improvements and best practices. Track progress and metrics regularly.<br>5) Audit each site/department ergonomics management system to ensure conformance to the company requirements, identify good practices and opportunities to improve, and engage leadership to refine their plans and focus to sustain the process. |
| 10. Frederick D. Straub (2017) [20] | The perceived importance and degree of implementation of ergonomics-related leading safety performance indicators in the American | This study examined ten leading ergonomic safety performance indicators (SPIs) using survey responses from occupational safety and health (OSH) | The following major findings were identified:<br>1. The use of leading ergonomic safety performance indicators (SPIs) in the workplace is not a widely accepted practice. Approximately two-thirds of the companies participating in this study do not use leading ergonomic safety performance indicators (SPIs). |

| Author/year | Title | Methodology | Results |
|---|---|---|---|
| | | | 2. For those occupational safety and health (OSH) coordinators who do use leading ergonomic safety performance indicators (SPIs), they generally perceived them as being valuable.<br>3. This study did not find significant differences in perceived levels of importance based on job classification or education. This was mostly due to the characteristics of the study sample.<br>4. Lack of management commitment and an absence of knowledge are commonly<br>perceived barriers to implementing leading ergonomic safety performance indicators (SPIs). The cost of implementation was the least frequently perceived barrier.<br>5. Leading ergonomic safety performance indicators (SPIs) most favored by the occupational safety and health (OSH) Coordinators who use them included the measurement of workers' early reporting of ergonomic strains and sprains, tracking the number of job hazard analyses conducted to avoid ergonomic hazards, and tracking the use of pre-hazard controls to avoid ergonomic hazards. |

## 5. Discussion and Conclusions

Review of the literature the results of ergonomics management protect of musculoskeletal disorders from working. 10 studies the results are as follows.

1. It was indicated by the experimentation that the anthropometrics data of Thai males would be very useful for the efficient workstation design in order to reduce muscular fatigue and get more productivity.

2. That the redesigned workstation can decrease one step of the working process. It can decrease of working distance and of working time. The satisfaction of the officers is also in the high level after the redesign.

3. Improving the practice of sitting with the chair and tray rack can be reduced. Muscle fatigue of workers and increase productivity.

4. A participatory ergonomic model should be used to monitor, prevent, and reduce risk factors and skeletal system disorders.

5. The results of ergonomic health promotion program activities is original working unit with concentrated on healthy workplace and far away from working disease. This clear processing process are systematically steps.

6. That tapping rubber chair can reduce the ergonomic risks and help reduce Musculoskeletal symptoms of para-rubber farmers.

7. Implementation of the potential solution at the plant was not achieved, and thus the longterm impact of the participatory ergonomics methodology remains to be studied further.

8. The training must involvevboth the owner and supervisors to convince masonry workers that certain ingrained habits and practices are no longer acceptable, and to adopt the safer practice identified in the training.

9. The structure of the proposed International Standard Organization (ISO 45001) refines the structure of existing safety management systems. All of these systems provide a familiar common framework and terminology for managing workplace hazards. This same framework can be applied to systematically identify, control and verify reduction of the risk factors that cause musculoskeletal disorders (MSDs) in the workplace. Aligning how the organization addresses ergonomics using a management system enables OSH professionals to communicate and engage business leaders in a manner with which they are already familiar. In turn, this approach has been proven to improve the effectiveness and efficiency of managing and controlling musculoskeletal disorders (MSDs) risk factors in today's workplace.

10. The researcher posited that measuring the degree of Ergonomic Management Control Program (EMCP) implementation, via tracking leading ergonomic safety performance indicators (SPIs), would enable occupational safety and health (OSH) professionals to evaluate the effectiveness of their ergonomic efforts in an ongoing manner, forecast pending shortcomings, and afford Occupational Safety and Health (OSH) intervention to reduce risk and prevent future occupational loss events.

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