REVIEW PAPER

ERGONOMIC RISK ASSESSMENT AMONG PRODUCTION OPERATORS AT FOOD PROCESSING INDUSTRIES : A REVIEW

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ABSTRACT

Ergonomic risk factors is defined as the design of the workplace, equipment, machine, tool, product, environment and system, taking into consideration the human's physical, physiological, biomechanical and psychological capabilities and optimizing the effectiveness and productivity of work systems while assuring the safety, health and wellbeing of the workers. In general, the aim in ergonomics is to fit the task to the individual, not the individual to the task. The aim of this study is to understand the impact of ergonomics risk factor among production operators at the food processing industries. This review evaluates selected papers in manufacturing industries that have studied risk factors of musculoskeletal symptoms among manufacturing operators. Furthermore, other related industry studies have been reviewed as applicable. To understand the risk factors of musculoskeletal symptoms among manufacturing operators, it is recommended that future studies be required to assess these risk factors among manufacturing operators.

Keywords: *WRMSDs, NMQ, Ergonomic Risk Assessment (ERA), Food Processing Industries*

INTRODUCTION

Workplaces traditionally have been designed to move products or support machines efficiently. Since people have always seemed so adaptable, how they fit into the workplace has received less attention. The increasing number of injuries caused by repetitive motion, excessive force and awkward postures, ergonomics has become a critical factor in workplace safety (Jaffar & Lop, 2011). Ergonomics and human factors are often used interchangeably in workplaces. Both describe the interaction between the worker and the job demands. The difference between them is ergonomics focuses on how work affects workers, and human factors emphasize designs that reduce the potential for human error (Jaffar & Lop, 2011; Hagberg, 1992)

The food industry is part of the national livelihood. Few years back, the introduction of a large number of automated machinery, operators maintained unnatural posture in high repetitive work over a prolonged period of time. Along with material handling, it caused excessive use of certain parts of the body to the increase of discomfort in the musculoskeletal system. The health constraint faced by production workers affects the quality of the work. The productivity of the workers is affected by the Work-related Musculoskeletal Disorder which limits the movement of the workers. Normally, the injuries happen either at the muscles, tendons, nerves, blood vessel or ligaments. The comfort workplace condition, known as ergonomic environment is important to prevent the occurrence of the Work-related Musculoskeletal Disorder. Health problems may occur because of continuously performing repetitive tasks, working in repeated and sustained or difficult postures, performing strenuous physical work, and using forceful exertion. Proper ergonomic workplace considers the condition of the workers while doing the assigned work. Food processing work can be physically demanding as material handler as tasks involve manual lifting, lowering, carrying, pushing and pulling loads. The nature of this work puts them at a risk for serious low back pain, shoulder pain and other musculoskeletal injuries.

REVIEW

Ergonomic Risk Factor Related to Musculoskeletal Disorders among Production Operators

Ergonomic risk factors are aspects of a job that can cause stress on the employee, for example awkward postures, highly repetitive tasks, forceful exertion, static postures over a long period of time, and environmental factors. This conditions may cause or contribute to Musculoskeletal Disorders (MSDs) among the workers if it is continuosly exposed to ergonomic risk factors. There are several factors that commonly associated with risk which are psychosocial, individual, workplace physical requirements, and workplace organizational factors (Jaffar & Lop, 2011).

According to Mustafa (2009), in order to ensure the health and safety of the workers, ergonomic programs is one of the good strategy to acticipating, identifying, designing, developing, analysing and controlling ergonomic risk. In other words ergonomics program helps in enhance the awareness of

ergonomics amog workers at manufacturing industry.

Awkward Posture

Awkward posture refers to positions of the body that deviate significantly from the neutral position while performing work activities. When you are in an awkward position, muscles operate less efficiently, and more force must be expended to do the task. Figure 1 illustrates the awkward posture of the workers at manufacturing industry.

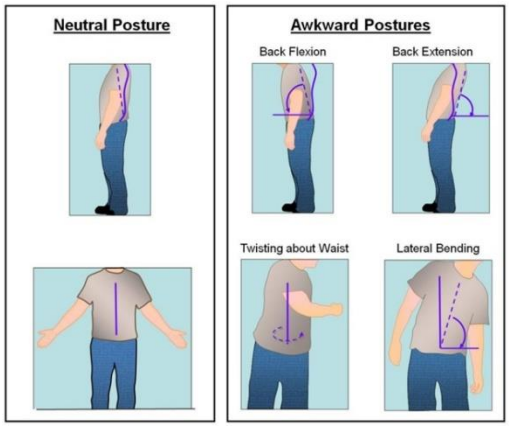

Figure 1. Awkward Posture

Awkward working posture at the trunk, neck and shoulder may be caused by a number of factors, including workstation layout, visual demands of the job, design of equipment and tools, and work method. Because awkward posture is a recognized risk factor for the development of fatigue, discomfort, and/or disability, the elimination or reduction of awkward work posture is a major objective of many workplace ergonomic programs (Keyserling *et al.*, 1993).

Repetition Motion

Repitition rate is defined as the average number of movements or exertions performed by a joint or a body link within a unit of time or performing similar motions with the same body part with little rest or recovery (Jaffar & Lop, 2011). Repitition put workers at a higher risk of injury when other risk factors are also present such as an awkward posture or heavy force (Jaffar & Lop, 2011). Cleaning work for housekeeping task involves repetitive motion and awkward posture and this may lead to discomfort ergonomic situations, which in turn may contribute to MSDs (Nasrull *et al.*, 2017; Barr, n.d.). Repitition also was the time quantification of a similar exertion performed during a task. In retail supermarket industry checkout operators play pivotal role in the system by performing repetitive light manual material handling tasks while scanning and handling products which involves select, grab, lift, orientate, move and place of various articles at checkout points along with static work posture irrespective of sitting/standing workstation which result in high risk of musculoskeletal disorders, unsafe posture, muscle fatigue and other discomforts such as back pain, disc pressure, reduced circulation, pregnancy related problem among the operators.

Futhermore, one of the most repetitive task issues were among sewing machine operator in the textile manufacturing industry. Numerous studies internationally have highlighted musculoskeletal risk factors associated with the textile industry and garment-making jobs because of highly repetitive work in awkward work postures.

Musculoskeletal Symptoms among Male and Female Workers

In 2009, the footwear industry is an important sector in brazil where there were 17,727 workers in the industry. There are also a growing number of studies on differences between male and female workers in relation to MSD symptoms, stress, sedentary lifestyle, alcohol and tobacco use. However, due to the growing participation of woman in the labor market it is important to carry out further studies to investigate the differences in risk factors for male and female workers in different sectors and countries. Female workers comprise approximately 40% of the workforce. In Brazil, 55% of women 16 years old or older work. However, their increased participation in the workforce did not reduce their roles as mothers, wives and home managers. For the most part women and men still have different roles in many societies, often resulting in women having triple-shifts as a worker, wife and mother as well as performing more repetitive tasks. Additional studies on the factors that affect female and male workers' health are needed (Ramos *et al.*, 2015). Figure 2 shows the footwear manufacturing departments.

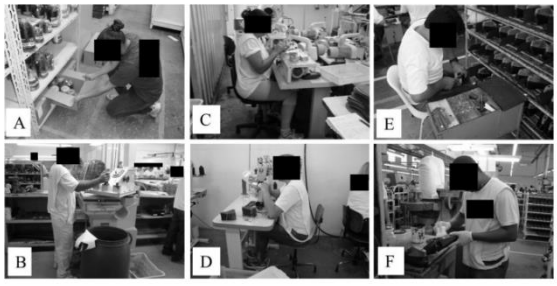

Figure 2. Footware manufacturing departments; (A) warehouse; (B) cutting; (C) preparation; (D) stitching; (E) assembly; (F) finishing (Kok *et al.*, 2017)

Gender differences concerning musculoskeletal complaints and pain have been reported in multiple studies. Most studies report female gender have higher prevalence rates musculoskeletal complaints compared to male. Female workers were report pain more

frequently, and complaint more intense and longer pain compared to men. Women also have higher rates of sick leave due to musculoskeletal complaints (Kok *et al.,* 2017)

FINDINGS & DISCUSSION

AUTHOR	TITLE	FINDINGS
(Öztürk & Esin, 2011)	Investigation of musculoskeletal symptoms and ergonomic risk factors among female sewing machine operators in turkey.	The highest prevalence rates for the women's musculoskeletal symptoms were in the trunk (62.5%), neck (50.5%), and shoulder (50.2%). 65% of women had experienced musculoskeletal pain or discomfort over the last 6 months. The final RULA scores of 6.9 indicate that the participants' postures at their work stations need to be investigated immediately.
(Imbeau, Major, Aubry, Delisle, & Eve, 2015)(Imbeau *et al.,* 2015)	Influence of musculoskeletal pain on workers' ergonomic risk-factor assessment	The workers were exposed to significant musculoskeletal disorder (MSD) risk factors, according to the FIOSH assessment and the high percentage of reported pain. Those who reported pain in the seven prior to the assessment evaluated their workstations more negatively than subjects who reported no pain, while the expert found no difference between the two groups' exposure to MSD risk factors.
(Fazi *et al.,* 2017)	Ergonomics study for workers at food production industry	The findings showed that the workers are exposed to the awkward postures which leads to the Work-Musculoskeletal Disorders (WMSDs). Futhermore, the best height of the worker at the study area (critical area) to prevent the worker from WMSDs is within 155 cm to 160 cm. The results show that the workers are exposed to the WMSD in different level of risks which causes high absenteeism among the workers.

CONCLUSION

To conclude, there was a high prevalence of musculoskeletal symptoms among manufacturing operators and may lead to work related disabilities and injuries. Futhermore, MSDs normally reported with a high proportion of symptoms such as in the lower back, shoulder, neck, and knees. Ergonomic risk factor such as repetition motion, awkward posture happen because of high prevalence of musculoskeletal symptoms among workers especially operators in manufacturing industry with dynamic jobs. In order for operators in the manufacturing industry to perform their work more efficiently, futher studies should focus on upgrading working positions and also worlwide brief about the awareness of ergonomics in workplace as well.

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