

CHAPTER

3

**ELECTROMYOGRAPHY SIGNAL
ANALYSIS TECHNIQUES
FOR SCREENING
MUSCULOSKELETAL DISORDERS**

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3.1 INTRODUCTION

Despite the availability of mechanised and automated equipment, manual handling is a popular and necessary method of performing material handling tasks. Musculoskeletal Disorders (MSDs) are frequently caused by these physical movements of the body. Malaysia, as a developing country focused on the industry sector, is seeing an increase in the number of patients treated at Social Security Organisation (SOCSO) rehabilitation centres for MSDs (Md Zein et al., 2019). Health screening tests are performed at the rehabilitation centres to train and diagnose MSDs patients using standard physical assessment procedures (Abdullah et al., 2017). However, the tests are completed manually with physical assessments done only with full assistance from an instructor. Based on this evaluation, the patient is evaluated for treatment or fitness to return to work. However, researchers are currently looking for the optimum processing technique to measure the human muscle condition when it comes to muscle fatigue monitoring.

Musculoskeletal Disorders (MSDs) are the second most common cause of disability in the workplace, and they can have an impact on worker fatigue and productivity. MSDs are injuries and illnesses caused by the movement of human bodies or the musculoskeletal system, such as muscles, tendons, ligaments, nerves, discs, blood vessels, and others (Agostini et al., 2020). Workplace pains and strains can be serious and harmful for workers due to MSD consequences, producing pain and hardship ranging from discomfort to severe impairment. All these ailments account for 40-50% of all work-related disease expenditures (Arial et al., 2014). Furthermore, MSDs account for 49% of absences lasting more than two weeks. The impact of MSDs can be complicated, and overall health recovery may take a long time, extending beyond the treatment and rehabilitation phase (Armijo-Olivo et al., 2016). Figure 3.1 shows the statistics in industries including construction sectors for 2016/2017 where 65% of workers were involved in MSDs.

Musculoskeletal Disorders (MSDs) are divided into two categories: upper and lower limbs. The limb region associated with back MSDs is the upper limb, which encompasses the shoulder, neck, hand, wrist, arm, and elbow (Charles et al., 2018). It is the source of the most common work-related ailments when compared to other parts of the human body. The primary occupational activities leading or exacerbating upper limb problems were judged to be manual handling (pulling/pushing and lifting), keyboard work or repetitive motions, and uncomfortable and taxing positions. Lower limb MSDs, which comprise the hips, legs, and feet, are the least often reported work-related MSDs (Hashim et al., 2014).

Musculoskeletal Disorders (MSDs) in the upper or lower limbs must be prevented because they have a direct impact on the individual and an indirect impact on the company's productivity. There is a strong link between MSD risk factors in the workplace and the development of these disorders. However, by taking the necessary precautions, it is possible to prevent these injuries by removing or reducing exposure to work-related risk factors, which can reduce the risk of MSDs in the workplace (Costa et al., 2017). Apart from that, by making simple and

basic changes, prevention can be simple and inexpensive, significantly lowering MSD risks (Gholami et al., 2014).

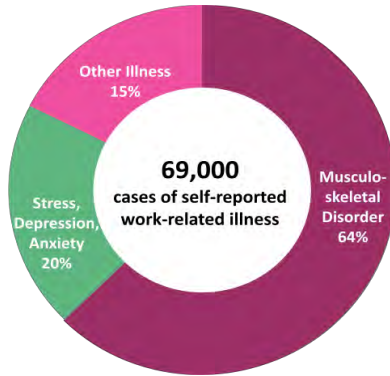


Figure 3.1 Case of self-reported work-related illness

There has been a greater emphasis in recent years on determining the causes of MSDs and taking steps to prevent them. To avoid low back pain, it is necessary to understand the concept and approach for detecting symptoms that contribute to MSDs (Daneshmandi et al., 2017). This chapter provides fresh perspectives on critical reviews and issues that have contributed to previous research findings being used as guidelines for future researchers.

Electromyography (EMG) is a common muscle signal used in a variety of man-machine interface applications. It's also been used in several therapeutic and industrial applications. It is produced during the contraction and relaxation phases of muscle contraction and relaxation. Furthermore, it was originally developed to study MSDs, and EMG recording has also been used to study the functional state of the muscle during various motions. The EMG signal, on the other hand, is a complicated and non-stationary signal with highly complex time and frequency characteristics. Many studies have been conducted in the investigation of EMG signals, particularly in the extraction of EMG signals.