A PRELIMINARY STUDY OF POSTURAL SAFETY AND LOW-COST ELECTROMYOGRAPHY (EMG) TOWARDS LOGISTIC WORKERS IN KUCHING SENTRAL

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ABSTRACT: *In lifting the heavy object, the muscles of a person are strained. The incorrect posture of lifting objects may lead to some damage to muscles causing back pain or low back pain. This back pain is mostly reported as musculoskeletal problems in the workplace and as individuals. The back pain of the worker can be reduced if the worker is following the DOSH Lifting Requirement. Therefore, this study is conducted to evaluate the worker's postural safety while lifting and to investigate the factors that affect muscle activity by identifying muscle activation at the back of the body. The data were collected from the selected logistics bus company located in Kuching Sentral Bus Terminal, Sarawak. The developed low-cost electromyography (LCEMG) device was used to identify the raw EMG signal of the workers. The data collected can be visualized by using App or Web-based that displayed real-time data monitoring of EMG signal through ThingSpeak. The comparables of body posture while lifting the heavy object with and without using the belt support among the workers at Kuching Sentral Bus Terminal were also measured and analyzed using Human Builder in CATIA Software to get RULA Analysis score. The result shows that the efficiency of lifting with less back pain was dependent on the belt support that the worker used. It also shows that muscle activity can be reduced if the worker using the belt with the correct posture to lift an object.*

Keywords: Postural safety, Low-cost device, Electromyography (EMG), Workers, Logistic, Low back pain, RULA

1. INTRODUCTION

Physical activity is a factor influencing personal satisfaction and life span. One of the most common physical activities by society is lifting an object. If lifting heavy objects or do repetitive works for a longer time without correct body posture will lead to musculoskeletal disorders (MSDs) problems. Sometimes it is assumed that if this physical activity using smaller and weaker muscles to lift the heavy objects, it might strain the muscle which will cause fatigue and injury. Therefore, strong muscle of the thighs and hips are needed by bending the knees and squatting. Avoid bending from the waist when lifting, as this involves the small muscles of the back. Without correct body posture, it led to the injury of the back muscles.

As the study shows that, low back pain (LBP) is a common health problem where most workers are expected to experience symptoms of low back pain during their working in the workplace [1,2]. Many studies show that low back pain (LBP) of the workers gives a significant impact both directly and indirectly to themselves and also their families, industries, and governments [3,4,5,6]. On the other hand, research also states that LBP is the fourth-most common reason for hospitalization for the worker due to work-related musculoskeletal disorders (MSDs) [7]. Therefore, a study on this musculoskeletal disorder can help the worker to reduce the LBP to prolong the lifestyle and working life in the workplace.

To investigate the muscle activity towards workers back muscles, the integrated usage of electromyography (EMG) is one of the methods. As is know that EMG signals are considered most useful as electrophysiological signals in both medical and engineering fields [8]. EMG signals can record the basic human body's behaviors under normal and pathological conditions [8]. To date, there has been limited study on EMG toward logistic workers, especially in Malaysia. A general study indicates some workers tend to not wear belt support as back protection while performing the lifting work. Other than that, workers also sometimes performing lifting works without correct posture and ignore the safety of their back. Therefore, the purpose of this preliminary study is to identify the awareness of back pain problems among workers and investigate the muscle activity of the workers using developed low-cost EMG device.

2. METHODOLOGY

The research strategy of this study is based on the projects or articles that have been conducted by other researchers. The information such as facts regarding back pain injury, the postural safety to loading and unloading heavy objects, the effectiveness of the posture brace, an existing system for loading and unloading luggage at the logistic workplace was gathered from the literature reviews. This questionnaire also used indirectly partly used Nordic Questionnaire for Musculoskeletal Symptoms identification [9]. This study includes the observational method with the survey method, testing byusing developed low-cost EMG devices and analyzing the Rapid Upper Limb Analysis by using CATIA software. CATIA can simulate the manikin to imitate the human movement to get RULA analysis [10].

2.1 Questionnaires

Data were collected via anonymous questionnaires. The questionnaires consist of personal details of the workers at the logistic center and how the logistic activity affected them. All of the 10 respondents (workers) from the 2 different