Biomechanical Analysis of a Manual Materials Handling Task in a Local Manufacturing Company

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Abstract: The aim of this study was to identify the level of risk in the manual material handling task and provide a set of recommendations to reduce it, prevent the presence of musculoskeletal disorders, and increase the production. This evaluation was performed using 3DSSPP® software and Ovako Working Analysis System (OWAS) technique and administering a survey on operator’s musculoskeletal discomfort and complaints. A 15-minute video was recorded during normal operation condition to perform task analysis; heart rate was monitored and recorded to obtain estimate metabolic rate. According to estimated metabolic rate, this task was classified as of high metabolic rate, which can influence on physical performance ability of the worker. Results showed worker exposure to a high risk level postures which can potentially have dangerous effects on the musculoskeletal system. Analysis revealed an unacceptable compression force level at L4-L5 intervertebral disc. A set of recommendations, including cart redesign and incorporating ergonomic principles, were suggested in order to reduce forceful exertions while pushing the cart and prevent the musculoskeletal injuries and disorders. These set of ergonomic evaluation tools are helpful since they complement each other for more reliable results.

Keywords: Biomechanics, Manual Handling Material, Ergonomic evaluation

1. INTRODUCTION

Despite current knowledge on the association of work-related musculoskeletal disorders (WRMSDs), many occupations are still associated with strenuous working postures and movements combined with a heavy physical work load (Pinzke, 2000). Manual materials handling is one of the major causes of severe industrial injury (Fredericks, Kumar, and Karim, 2008). Low back pain is a major contributor to escalating health care costs and disability in North America (Nelson-Wong and Callaghan, 2010). Some authors (Kivi and Mattila, 1991; Mattila, Karwowoski, and Vilikki, 1993), affirm that musculoskeletal disorders and occupational injuries are a major occupational problem even in the highly industrialized countries. Back pain is very common among adults who regular basis physically move or lift objects (manual materials handling) increase the strain on their lower back and the risk of developing lower back pain (Verbeek, Martimo, Karppinen, Kuijer, Takala, and Viikari-Juntura 2012). In Mexico, Instituto Mexicano del Seguro Social (Mexican Social Security Institute by Spanish acronym)