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

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Author's Note: Ing. Karla Gabriela Gomez-Bull has an Industrial and Systems Engineering degree from Universidad Autonoma de Ciudad Juarez, Mexico, is actually student of Master degree on Industrial Engineering with specialty on ergonomics at Universidad Autonoma de Ciudad Juarez, with interest area on ergonomics and biomechanics, contact information karla.gomez@uacj.mx. Dr. Gabriel Ibarra-Mejia has a MD and MS degree from Universidad Autonoma de Ciudad Juarez, he also has an MS degree in Ergonomics from Lulea Tekniska Universitet in Sweden, and a PhD in Environmental Science and Engineering from the University of Texas at El Paso, actually joined the Department of Industrial Engineering at the Universidad Autonoma de Ciudad Juarez in charge of the Technological Planning and Ergonomic Design Academia. M.C. Juan Luis Hernandez-Arellano has an Industrial Engineering degree from Instituto Tecnológico de Celaya, he also has a MS degree on Industrial Engineering from Instituto Tecnológico de Celaya, actually student of Doctoral degree on Industrial Engineering at Universidad Autonoma de Ciudad Juarez, with interest area in ergonomic design, fatigue and structural equation models.

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