Proceedings of the 5th Annual World Conference
of the Society for Industrial and Systems Engineering,
San Francisco, CA, USA
October 13-14, 2016

Using the Revised NIOSH Lifting Equation in the Mexican Workplace: Biomechanical, Physiological, and Psychophysical Differences

M. Christian[1], J.E. Fernandez[1], G. Ibarra-Mejía[2] and R.J. Marley[3]

[1]JFAssociates, Inc.
Vienna, Virginia 22181, USA

[2]University of Texas at El Paso
Department of Public Health Sciences
El Paso, Texas 79968, USA

[2]Universidad Autonoma de Ciudad Juarez
Department of Industrial Engineering
32310 Cd Juárez, Chih., Mexico

[3]Missouri University of Science and Technology
Office of the Provost, 210 Parker Hall
Rolla, Missouri 65409, USA

Corresponding author's Email: jf@jfa-inc.com

Author Note: Dr. Marc Christian obtained his PhD from Virginia Tech in 2014 and is currently the Managing Engineer at JFAssociates, Inc. and also serves as the Newsletter Editor for the International Society for Occupational Ergonomics and Safety. His expertise and research includes occupational ergonomics, workplace injuries, and biomarkers related to tissue injury.

Dr. Jeffrey Fernandez is the managing principal at JFAssociates, Inc. and is currently the president of the Board of Certified Professional Ergonomists (BCPE). He previously was a professor at Wichita State University, a Senior Research Associate at NIOSH, and is currently an adjust professor at George Mason University. Dr. Fernandez is internationally known for his research in occupational ergonomics and industrial engineering.

Dr. Gabriel Ibarra-Mejía MD PhD is an assistant professor at the University of Texas at El Paso's Department of Public Health Sciences, adjunct professor at the University of Texas Health Science Center at Houston, and at the Universidad Autonoma de Ciudad Juarez's Department of Industrial Engineering. His areas of expertise are in environmental, occupational health and industrial ergonomics focusing on the work design for the prevention of work-related musculoskeletal disorders.

Dr. Robert Marley is the Provost and Executive Vice Chancellor of the Missouri University of Science and Technology in Rolla, Missouri. He is also a Professor in the Department of Engineering Management and Systems Engineering, and maintains research and teaching interests in human factors, occupational ergonomics and safety engineering. He is a Board Certified Professional Ergonomist (CPE).

Abstract: The Revised NIOSH lifting equation (RNLE) is designed to approximate the relative risk of developing low-back injuries for two-handed, stationary, lifting tasks. Biomechanical, physiological, and psychophysical studies of the US population were used when determining appropriate RNLE threshold values in order to minimize the risk of low-back injuries. Despite being designed for the US population, the RNLE has gained international popularity primarily due to its ease of application and studies demonstrating successful reductions in low-back injuries in the US. Since only task-related factors determine the risk, the RNLE inherently assumes the same biomechanical, physiological, and psychophysical criteria for all people.

A number of studies have demonstrated that Mexican and Hispanic American populations generally have lower threshold values for the biomechanical, physiological, and psychophysical criteria which are assumed constant in the RNLE. It is well documented that Mexican populations typically have smaller anthropometric measures, and that Hispanic Americans are less tolerant to pain and discomfort than those in the US. Such differences suggest that the RNLE may underestimate low-back injury risk when applied in a Mexican workplace and that modifications to the measured RNLE factors are needed to accurately estimate risk.

Keywords: NIOSH Lifting Equation, Mexico, Anthropometry