

ABSTRACT

Development of a Low Cost Image Analysis System for the NIOSH Lifting Equation. (August 1993)

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A computer system was developed called Video Ergonomic Evaluator (VEE) to analyze video taped manual lifts according to the revised 1992 NIOSH lifting equation. The VEE system requires a computer with installed image capture board, windows 3.1, and the developed software. This system is intended to replace the manual measurement of the lift environment to gather lifting information. Currently, a tape measure is the most commonly used tool to measure the Horizontal and Vertical parameters of the NIOSH lifting equation. Using a robot to simulate a person lifting a load, a comparison study was performed to determine the measurement accuracy of both devices. Thirty participants, 15 male and 15 female, measured the horizontal and vertical parameters of nine different lifting positions.

Results of this study indicate that in overall measurement, the tape measure provided slightly higher accuracy than VEE. VEE measurement errors for horizontal distances tended to be greater than actual by 0.84 to 1.29 cm (95th C.I.), whereas tape measurement errors ranged from -0.68 to 0.42 cm (95th

C.I.) for horizontal distances. Vertical dimensions were underestimated by both methods, -2.72 to -2.16 cm and -2.42 to -1.43 cm respectively.

A previous study (Garg, 1989) indicates that the combined H parameter measurement and lifting error were greater than the measurement error found in this study for either VEE or a tape measure. Although the tape measure had a better overall accuracy, the variation of measurement error of both devices is well below the variation of a lifting person from trial to trial.

A separate but related study using the same participants was performed to compare two methodologies for acquiring information on the NIOSH lifting equation angle of twist parameter. It was surmised that many practitioners will guess the value of the A parameter, while others would measure this angle of twist directly. A comparison study was performed to determine the accuracy of estimating the angle of twist and measuring twist with an angular mechanical measurement device with electronic readout (Guymon Goniometer).

Unexpectedly, estimation of the angle of twist was found to be more accurate than using the Guymon Goniometer. A 95% confidence interval for estimation error ranged from -0.45 to 2.03 degrees while the 95% confidence interval for the goniometer was from -5.28 to 3.36 degrees.