Can the Virtual Corset Accurately Measure Arm Elevation Angles for Ergonomic Research?

Validation of tri-axial accelerometer for the calculation of elevation angles

Tal Amasay, Keely Zodrow, Laurel Kincl, Jennifer Hess, and Andrew Karduna. *International Journal of Industrial Ergonomics, September 2009.*

Overview

One of the main challenges in occupational studies of musculoskeletal disorders (MSDs) is how to quantify workers' exposures to risk factors during a workday. Studies have indicated that workers who spend much of the day with arms elevated higher than 60° are at increased risk of shoulder injury. Researchers in occupational studies commonly use accelerometers to measure arm elevation angles, but these devices are sensitive to linear acceleration and can only assess two axes of rotation. In the present study researchers tested the Virtual Corset, a pager-sized, battery powered, tri-axial linear accelerometer originally designed to measure trunk flexion. The Virtual Corset accurately predicted arm elevation angles under static conditions, but using the device effectively for angle measurement under dynamic conditions proved difficult.

Key Findings

- For the static condition, the RMS error of the calculated elevation angles was found to be less than 1°.
- Under dynamic conditions the calculated elevation angle error ranged from 10° to 80°. The farther the Virtual Corset was located on the arm from the axis of rotation (the shoulder), the higher the errors.
- From a practical point of view, use of the Virtual corset for quantifying shoulder elevation for static or sustained postures is appropriate, but if used for dynamic work, the elevation angle RMS errors of 10° and above might be too big and meaningless to analyze.

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See abstract:
http://bit.ly/1o7CxKK

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