

Back Lift versus Leg Lift: An Index and Visualization of Dynamic Lifting Strategies

Xudong Zhang, Maury A. Nussbaum, and Don B. Chaffin
Journal of Biomechanics, 33:777-782, 2000.

This technical note presents an index that quantitatively characterizes different dynamic postural strategies employed during sagittal plane lifting. Dynamic lifting strategies are modeled in the velocity domain as different schemes of partitioning postural changes between the torso and leg segments. The index consists of two parameters, assigned to two leg segments, which quantify their contributions relative to the torso. Given a measured lifting movement, its index parameter values, ranging from 0.1 to 10, are estimated through an enumeration search process with the objective of minimizing the fitting error. The use of this index is illustrated by applying it to 24 lifting movements performed by six subjects using either a back-lift or a leg-lift strategy. Results indicate that a lifting strategy, in terms of whether the leg or the back is the prime mover, can be well characterized and visualized using this simple two-parameter index. It not only differentiates the two distinct general postural strategies, but also discerns indistinct intermediate ones by quantifying the involvement of each segment in a lifting movement. Potential future applications include movement prediction and simulation for computerized biomechanical or ergonomic analysis.

abs2000_00