A Mathematical Musculoskeletal Shoulder Model for Proactive Ergonomic Analysis

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Occupational shoulder musculoskeletal injuries and disorders are common. Generally available shoulder work analysis tools do not offer insight into specific muscle load magnitudes that may indicate increased risk, nor do they address many concerns germane to job analysis. To address these issues, a biomechanical model of the shoulder was developed to include several critical components: the systematic inclusion of kinematic and kinetic effects, population scalability, geometric realism, and empirical glenohumeral constraint, and integration with digital ergonomics analysis software tools. This unique combination of features in a single model was explored through examination of both experimental and simulated data with the developed analysis tool. The utility of the model is discussed together with a review of its specific strengths and weaknesses, and the potential for its future use in proactive ergonomic analyses and workplace simulations.

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