Reaching and Object Movement Capability in the Spinal Cord Injured Population

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Seated human reaching and object movement capability is dependent on maximum muscle strengths in the torso, shoulder and upper extremity as well as balance maintenance. This paper presents an attempt to empirically describe and biomechanically model this phenomenon. The empirical work has relied on the new University of Michigan Human Motion Simulation Laboratory, which provides a facility for a robust and accurate measurement system of 3D human motions during prescribed tasks. The data gathered are reduced using a kinematics representation of the human body, which produces the dynamic posture data necessary to define the strength and balance requirements of a task. These data, along with muscle EMGs are being used to understand the different levels of performance and exertion required when people with thoracic level spinal cord injuries perform seated reaching motions.

We also are using a modification of our existing human strength prediction model (3DSSPP). This has been developed to allow us to compare normal population strength and seated balance requirements during seated reaching and light load movement tasks. Initial data obtained from reaching and object movement studies of people with and without thoracic level spinal cord injuries has begun revealing the biomechanical nature of the limitations in such task performances. In particular we are documenting the importance of lower torso and hip extensor control to maintain postural balance during those activities that require two-handed reaching and object moving tasks.

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