



Priority Statement Title: The Human Model-ome Project

Priority Statement Code: CJ4E

Domain: Joint/Limb/Function

Priority Statement

Background and Relevance

Biomechanical modeling is an important research tool for studying human movements, and potentially an effective and efficient tool for evaluating successes of interventions and treatments. Unfortunately, there is an alarming proliferation of “generic” models in the biomechanics field that suffer from a lack of robust input parameters (e.g., coordinates of muscle insertions, origins, and wrapping points, muscle optimal and slack lengths, tendon lengths, moment arms, material properties, and joint kinematics). Inappropriate input parameters likely result in erroneous results, misguided surgical recommendations, false hypotheses, inappropriate explanations of pathologies. In addition, global movement studies require thoughtful integration of information obtained on studies of muscle, tendon, ligament, bone, and cartilage. These fields largely exist independently and there are very few literature reports that cross the tissue boundaries. Such crossings are crucial to create reasonable large-scale models of human movement. Similar to the human genome project, there must be a concerted effort to create a large database of biomechanical modeling parameters in an organized manner that permits integration and sharing among investigators. Establishing this database and appropriate scaling methods will set the foundation for developing valid models, and assist in improving accuracy of model predictions and developing individualized models with significant applications in research and clinic practice.

Lack of funding and standardization are two major barriers.

Objectives

1. Obtain comprehensive musculoskeletal parameters sets from a large sample size that is diverse across a variety of factors (gender, ages, race, height, weight, and activity level).
2. Determine the co-variance of the musculoskeletal parameters in order to establish laws of scaling.
3. Standardize the testing and reporting to make the reported parameters consistent among investigators.
4. Establish a database that can be shared among investigators.

Recommended Actions

1. Establish a standardization committee with representatives from a variety of interested parties.
2. Obtain as complete as possible parameter set from each individual.
3. Parameters determined from cadavers as well as living subjects should be included in the database.
4. Issue an RFA to support research in this area.