COMPARING GLENOHUMERAL JOINT KINEMATICS USING MOTION CAPTURE AND TWO OPENSIM MODELS

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INTRODUCTION

- The shoulder is a complex joint system with a large range of motion.
- The muscles and soft tissues that surround the humerus and scapula make it difficult to accurately measure joint movements.
- Accurate kinematic models could improve assessment of joint motion.
- Several kinematic shoulder models exist, but it is unclear which one is the “right” one for a given study.

Objective: To evaluate whether two shoulder models provide equivalent interpretations of glenohumeral joint motion.

METHODS

Data was recorded with a 12-camera motion capture system and transferred to OpenSim 3.3¹ to test the MoBL-ARMS⁵ and scapulothoracic⁴ models. Inverse kinematics estimated plane of elevation, shoulder elevation, and shoulder rotation.

RESULTS & DISCUSSION

- The joint angles output by the two models are not equivalent.
  - For the extension task, the MoBL ARMS model averaged 88.5 degrees for plane of elevation angle while the scapulothoracic model averaged 43.9 degrees.
  - The glenohumeral joint demonstrate a larger and more variable range of motion in the MoBL-ARMS model than in the scapulothoracic model.
  - The standard deviation was larger for MoBL-ARMS model than the scapulothoracic model.
  - Differences in scapular motion could explain the differences in the magnitude of range of motion.

CONCLUSIONS

- This study highlights the importance of carefully selecting shoulder models when studying upper limb movement to obtain accurate data and reduce ambiguity about the “correct” measured movements.
- Future work includes collecting more data to evaluate to what extent the reported results hold across multiple subjects.

REFERENCES