

# WHITAKER BIOMEDICAL ENGINEERING INSTITUTE

## DEPARTMENT OF BIOMEDICAL ENGINEERING FRIDAY SEMINAR SERIES

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Center for Human Performance  
Children's Hospital  
San Diego, CA

### **“Sequential Body Motion and Shoulder Joint Torque Between Baseball Pitchers of Various Levels”**

**DATE:** April 1, 2005  
**TIME:** 1:00 p.m. – 2:00 p.m.  
**PLACE:** **Traylor 709**  
**Host:** Ed Bartlett

**Abstract:**

It's been suggested that improper timing in the sequence of body segmental motion during throwing results in increased forces and torques on the upper extremity. However, there currently is a paucity of quantitative data that substantiates this relationship. In this study, the sequential body motion and shoulder joint torques during baseball pitching were quantified and compared across four competitive groups of pitchers. Five professional, 11 collegiate, 12 high school, and 9 youth level pitchers were analyzed using automated motion analysis techniques. No significant kinematic differences in pelvis and trunk motion were found across all four groups of pitchers except for the starting time of trunk rotation. Professional pitchers rotated their torsos much later in the pitch cycle ( $34 \pm 5\%$ ,  $p=.01$ ) compared to lower level pitchers. Additionally, the shoulder internal rotation torque differed significantly among all four pitching levels with youth pitchers exhibiting the least amount of internal rotation torque ( $33 \pm 3$  N-m) compared to high school ( $66 \pm 6$  N-m,  $p<.001$ ) and collegiate ( $78 \pm 9$  N-m,  $p<.001$ ) pitchers. Pro level pitchers threw with less internal rotation torque ( $50 \pm 9$  N-m) than collegiate pitchers ( $p=.04$ ). The findings suggest that skeletally matured amateur pitchers generate high shoulder internal rotation torques to perhaps compensate for the early onset of trunk rotation, believed to be the cause of rotational energy loss to the throwing arm. This could help explain why upper extremity injuries tend to occur with 'poor' pitching mechanics. Hence, pitchers of all levels may benefit from lower stresses on the throwing arm by practicing proper sequential body motion as supported by this study.

**Any questions, contact 410-955-3132.**

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