Pitcher Biomechanics Analysis Project

1) Using your knowledge of pitching, and existing published research (e.g. Pubmed), evaluate key variables of the individual's pitching delivery. Is there anything you see of note?

Key variables: Stride length, knee flexion, shoulder abduction at foot contact, shoulder abduction, and forward and lateral trunk tilt at ball release.

Pitcher shows reduced stride length (82.70%) and shoulder abduction (77.14°), and greater knee flexion (55.49°) at foot contact. Pitcher also shows slight over-abduction (95.55°) of the shoulder and trunk extension (-30.86°) at ball release.

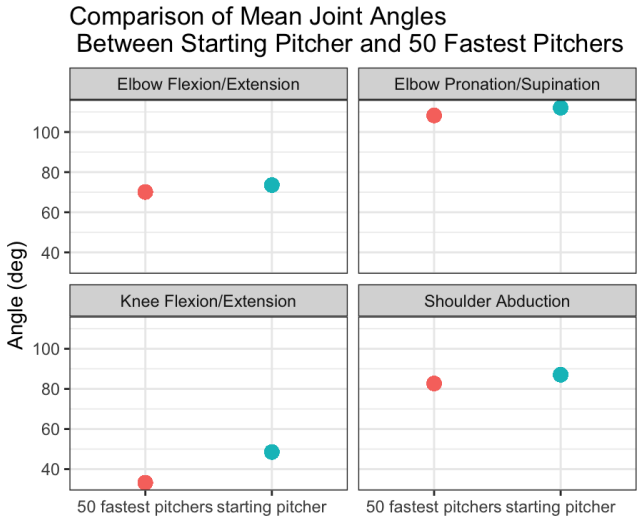
**() = mean values compared to papers below*

Escamilla, R., Fleisig, G., Barrentine, S., Andrews, J., & Moorman, C., 3rd (2002). Kinematic and kinetic comparisons between American and Korean professional baseball pitchers. *Sports biomechanics*, *1*(2), 213–228. https://doi.org/10.1080/14763140208522798

Fortenbaugh, D., Fleisig, G. S., & Andrews, J. R. (2009). Baseball pitching biomechanics in relation to injury risk and performance. *Sports health*, *1*(4), 314–320. https://doi.org/10.1177/1941738109338546

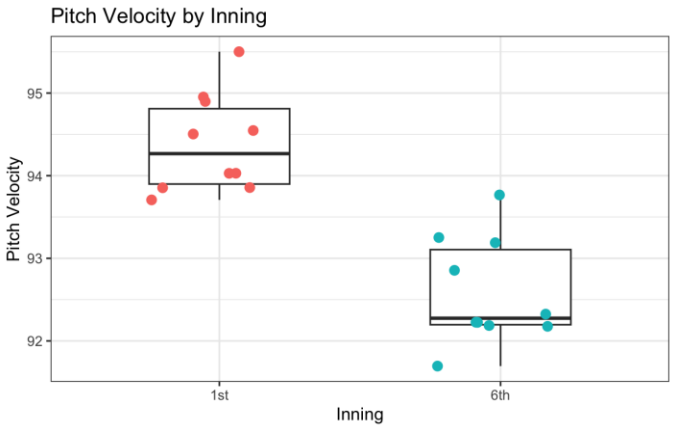
2) Use the 'MLB 50 fastest' pitching data to create plot overlays with the individual pitcher's data. How would you describe this pitcher's action compared to others in the league?

The starting pitcher has greater mean angles in knee flexion, elbow flexion and pronation, and shoulder abduction compared to other pitchers in the league.



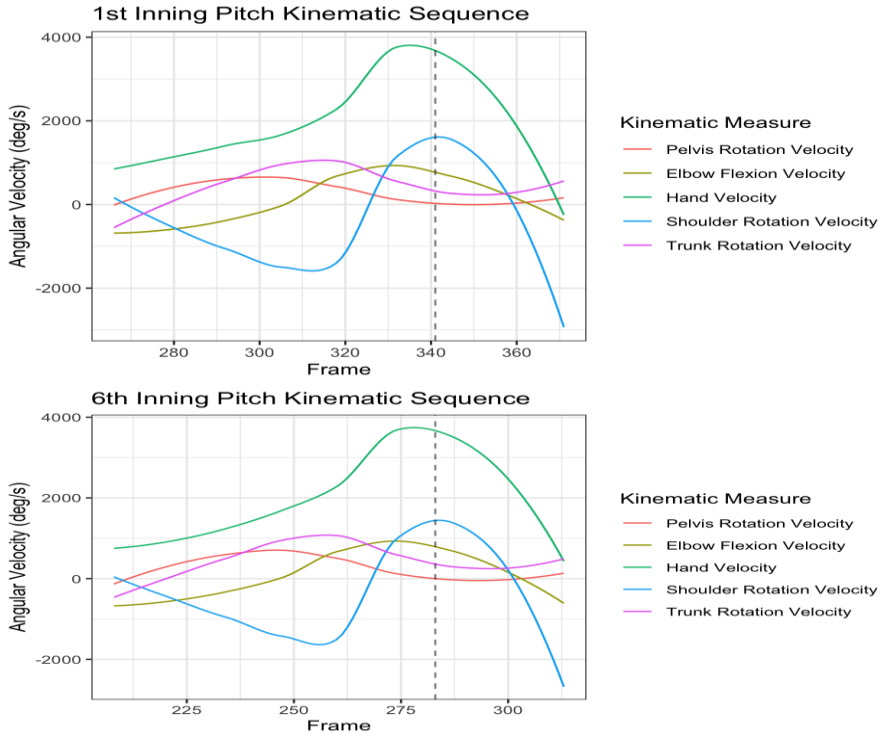
3) Can you see changes in pitch velocity between the 1st and 6th inning?

Mean pitch velocity in the 6th inning is significantly slower than the pitch velocity in the 1st inning.
T test: $t = 6.5099$, $p < 0.05$



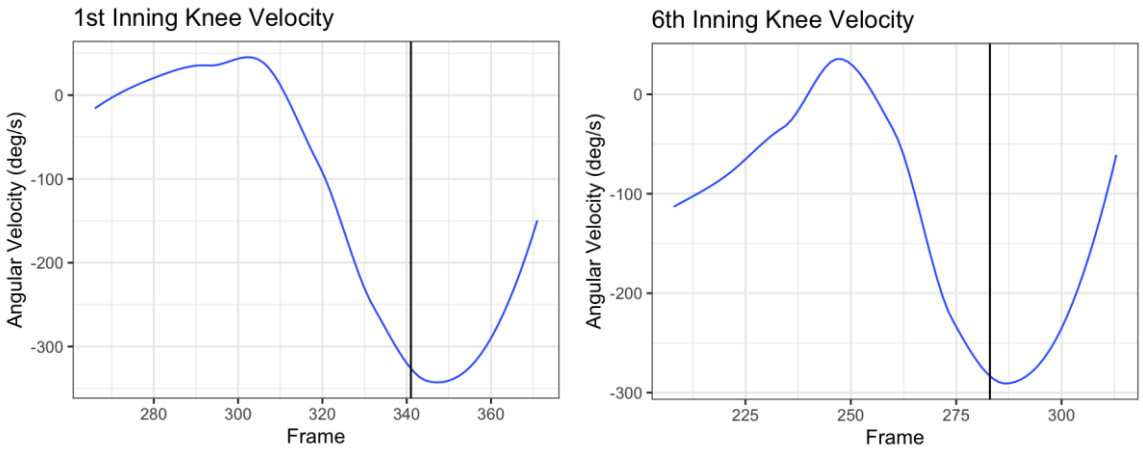
4) Create a plot with the kinematic sequencing for the pelvis, trunk, elbow, shoulder and hand for both innings and compare them. Has anything changed between the innings?

Comparing the kinematic sequence plots of a pitch in the 1st and 6th innings, there seems to be a slight decrease in hand and shoulder rotation velocity at ball release.



5) What other changes do you see that you might link to pitching velocity due to fatigue? Are you able to identify differences and provide visualizations of these changes?

After comparing one pitch in the 1st inning and one pitch in the 6th inning, the pitcher appears to have less knee extension velocity approaching ball release in the 6th inning compared to the 1st inning, which may be a result of fatigue and limiting his pitch velocity.



6) Would you recommend any modifications to the pitcher's delivery based on your observations? Explain why/why not?

One recommendation I would make to the pitcher's delivery is to sharpen up the kinematic sequencing between the shoulder and the hand. According to the sequencing plot should peak velocity occurs after the hand and after ball delivery, which may be suboptimal transfer of energy possibly taking away from a minor increase in pitch velocity.