

Player Name: Bowen Kortkamp
Handed: R

Height (mm): 152
Team Name: Elite Velocity LLC

File Name: phpTwUMQL_c5248b9f-05cd-4bed-900d-28cf4

Pitch Sequence Image Frames

Peak Leg Kick (PK)

Video Frame 19



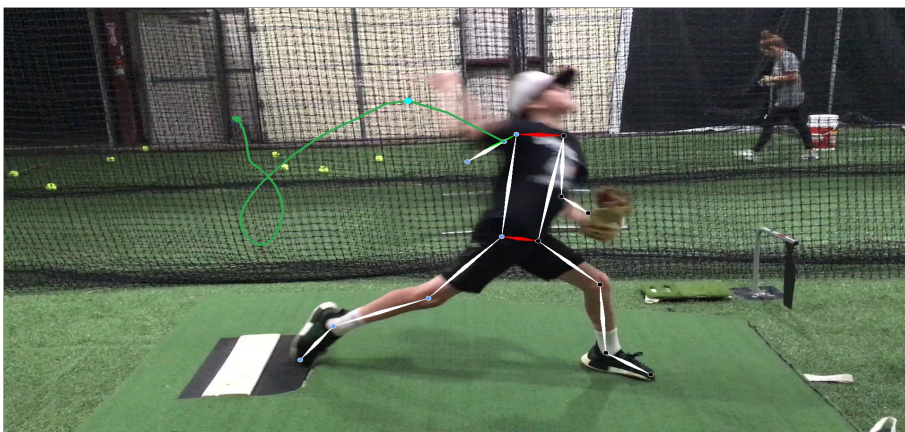
Foot Plant (FP)

Video Frame 60



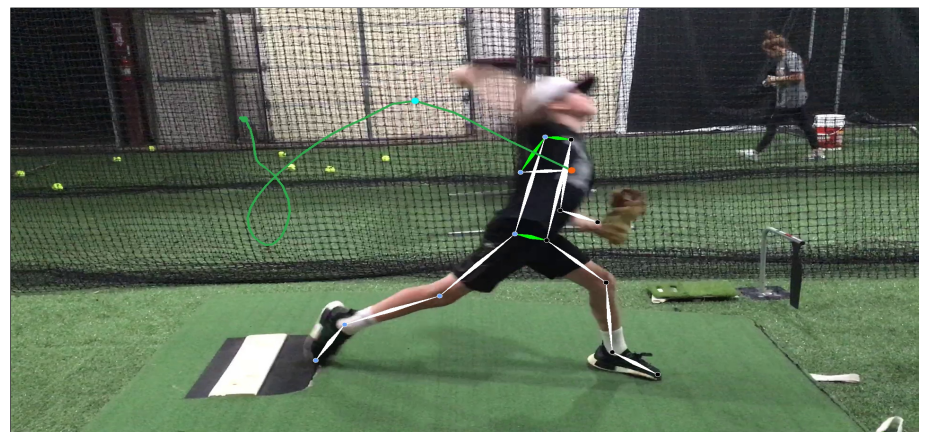
Maximum External Rotation (MER)

Video Frame 63



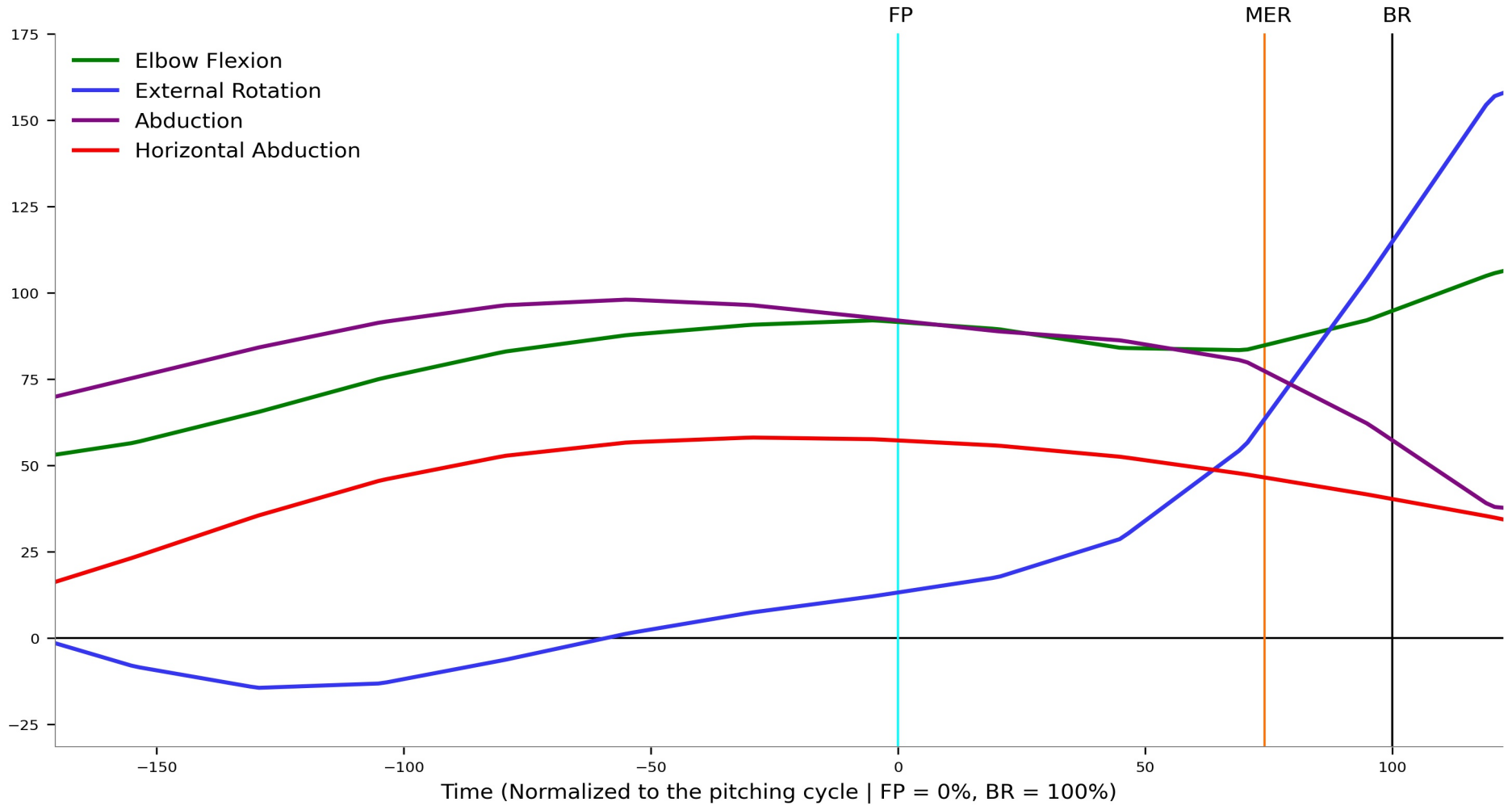
Ball Release (BR)

Video Frame 64



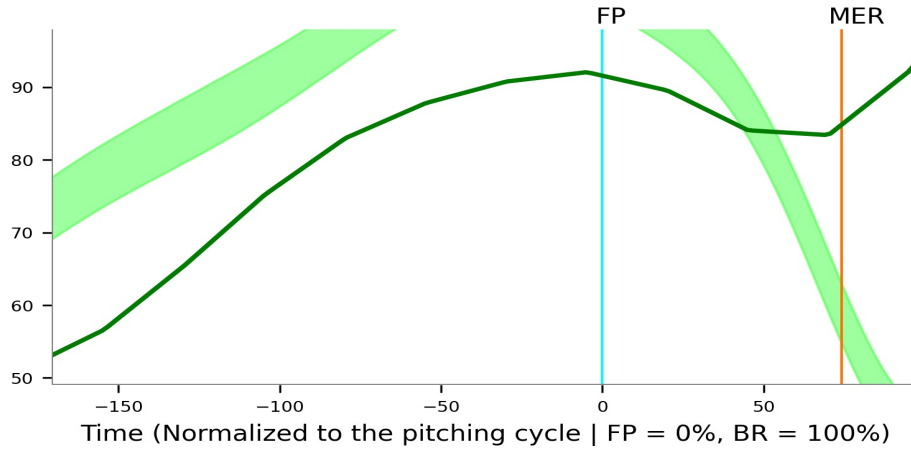
Arm Angle Kinematics Analysis (deg)

Arm Action Kinematics - Angle

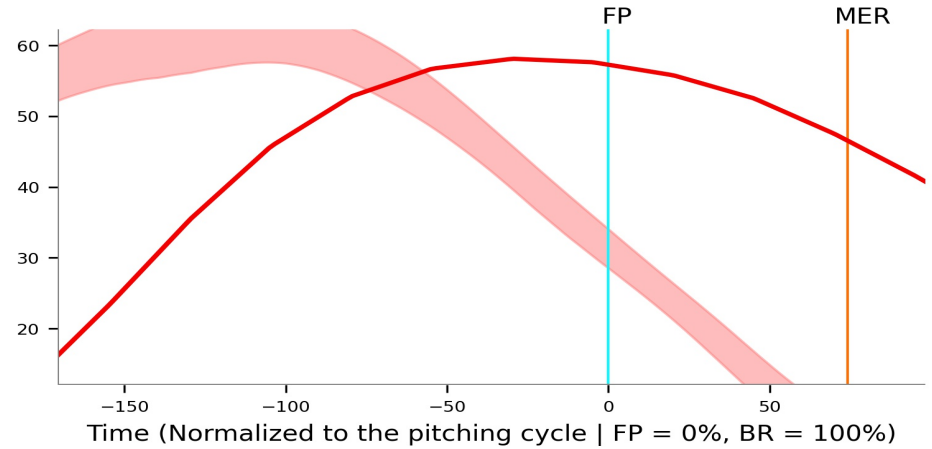


Arm Angle Kinematics Analysis (deg)

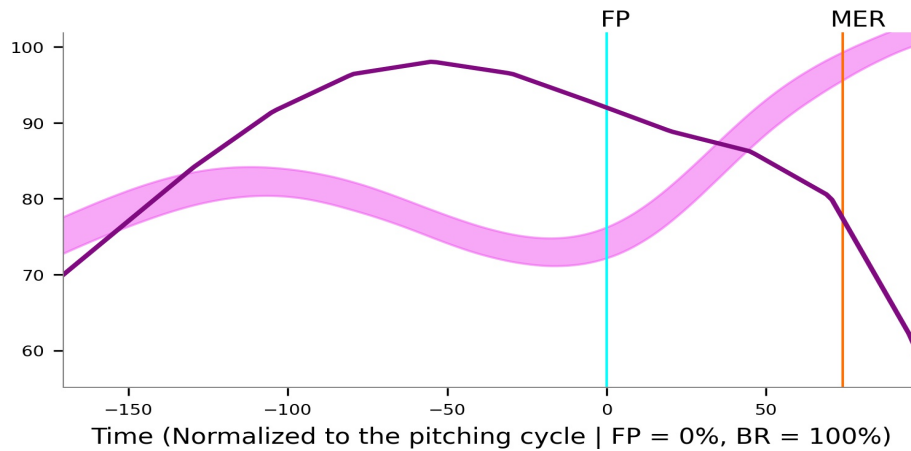
Elbow Flexion



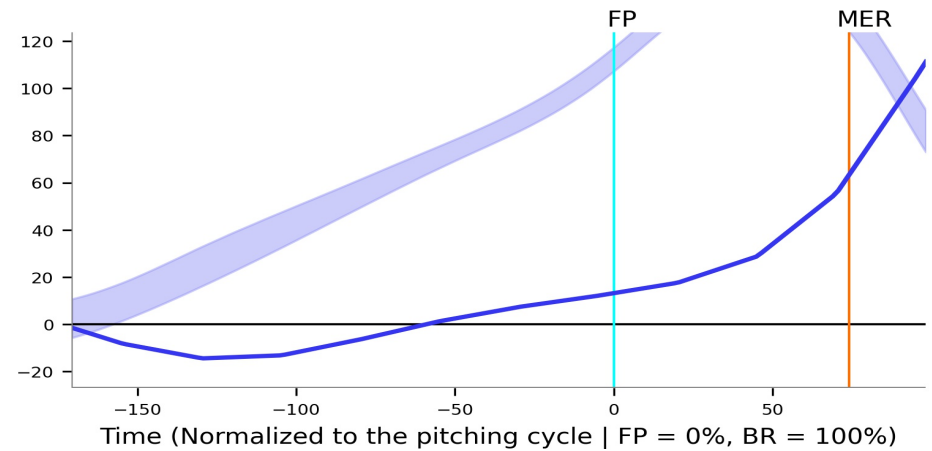
Shoulder Horizontal Abduction



Shoulder Abduction

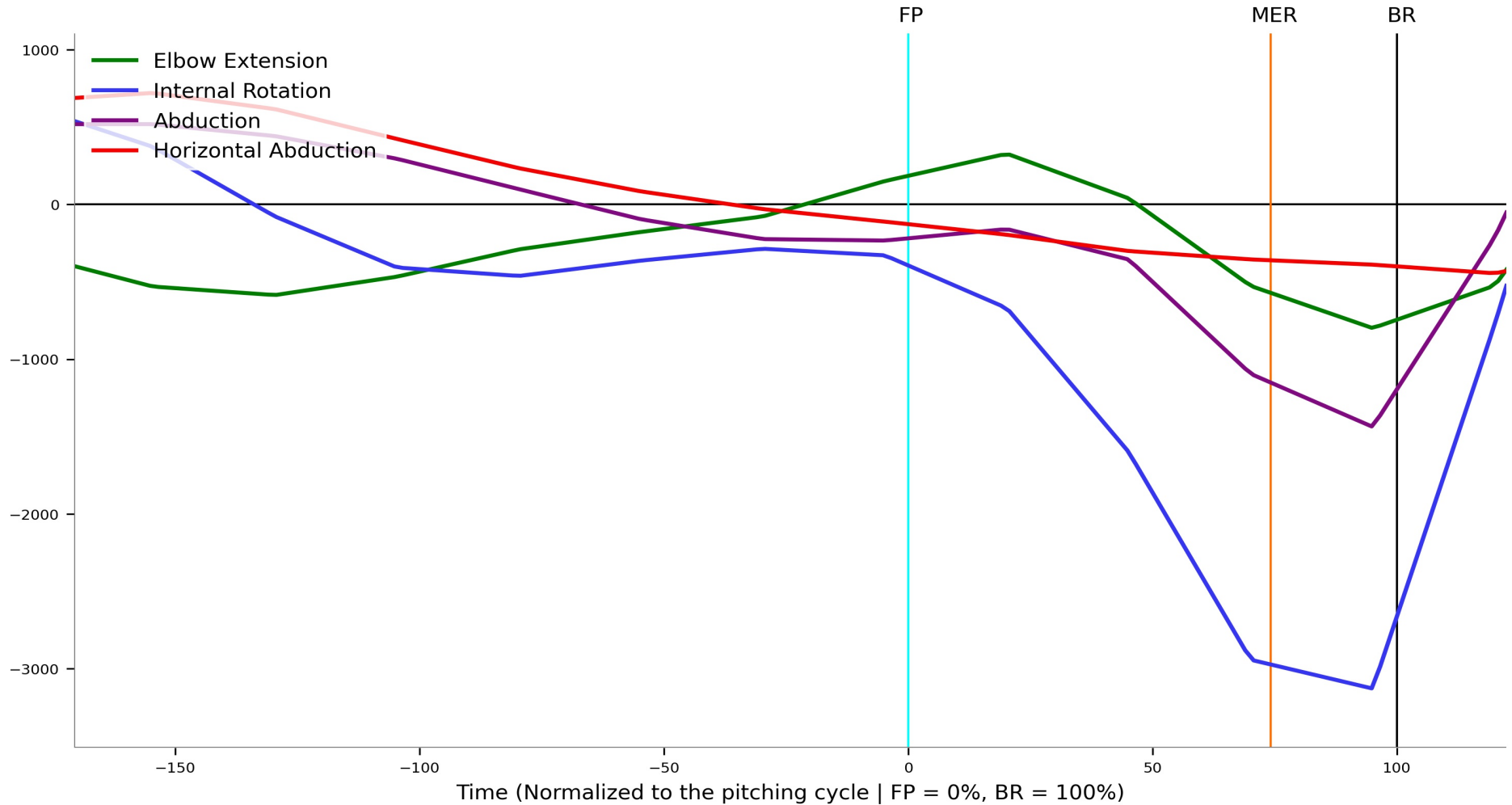


Shoulder Rotation



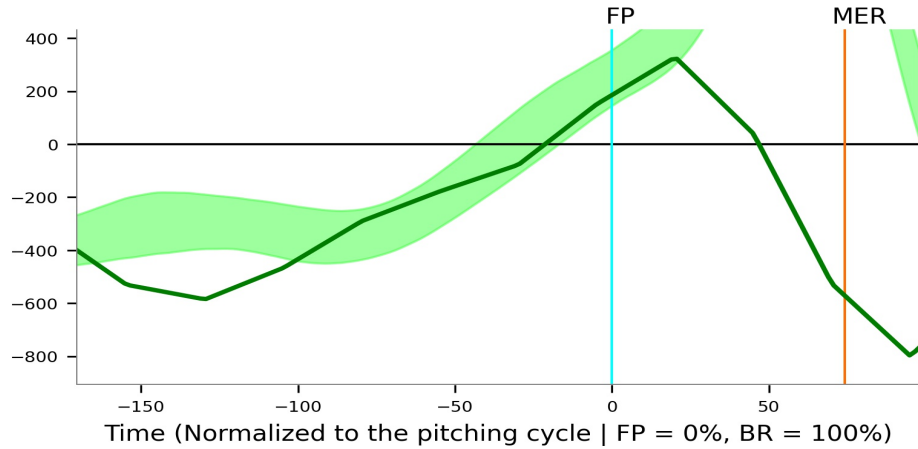
Arm Angular Velocity Kinematics Analysis (deg /sec)

Arm Action Kinematics - Velocity

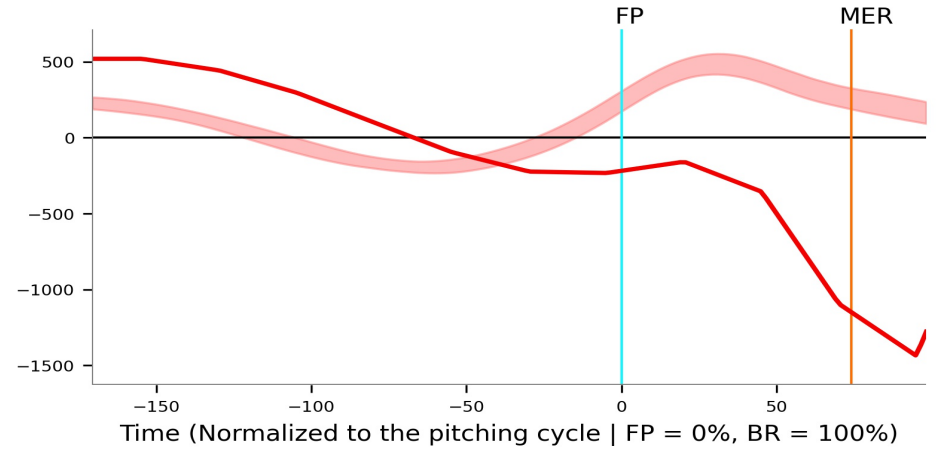


Arm Angular Velocity Kinematics Analysis (deg / sec)

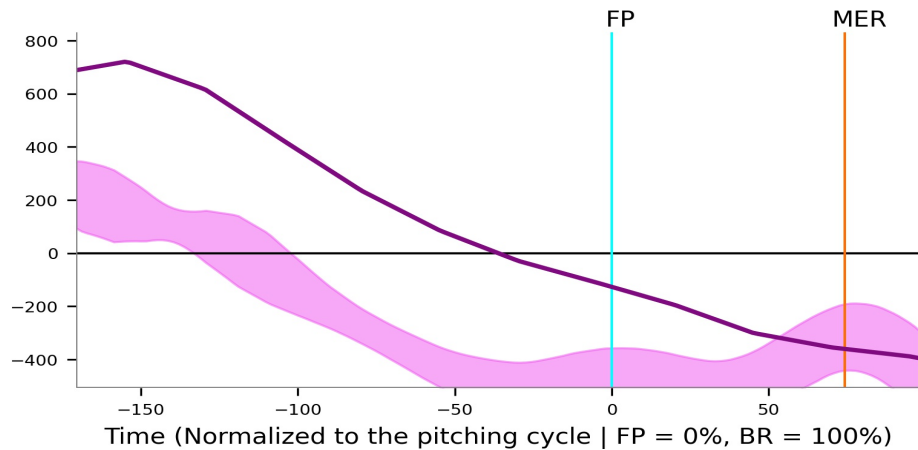
Elbow Extension



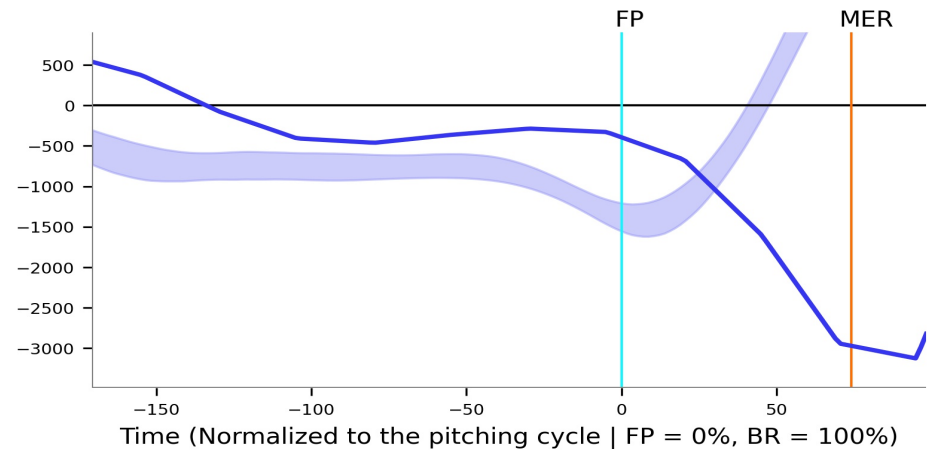
Shoulder Horizontal Abduction



Shoulder Abduction

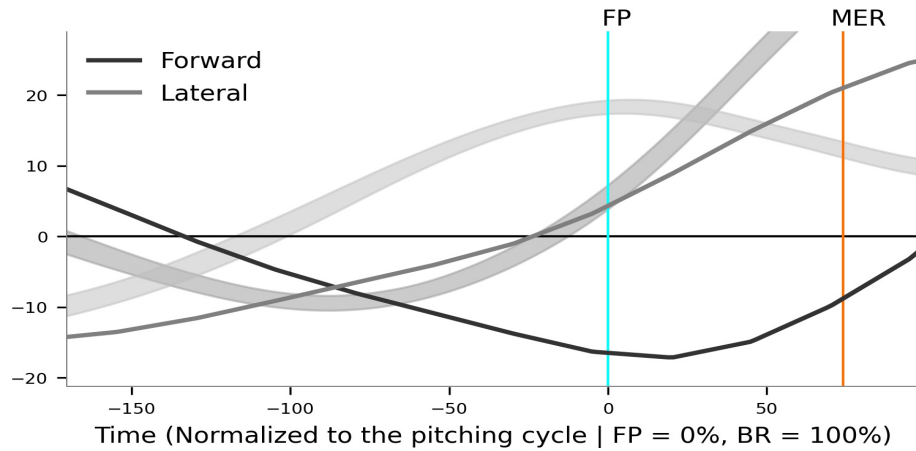


Shoulder Internal Rotation

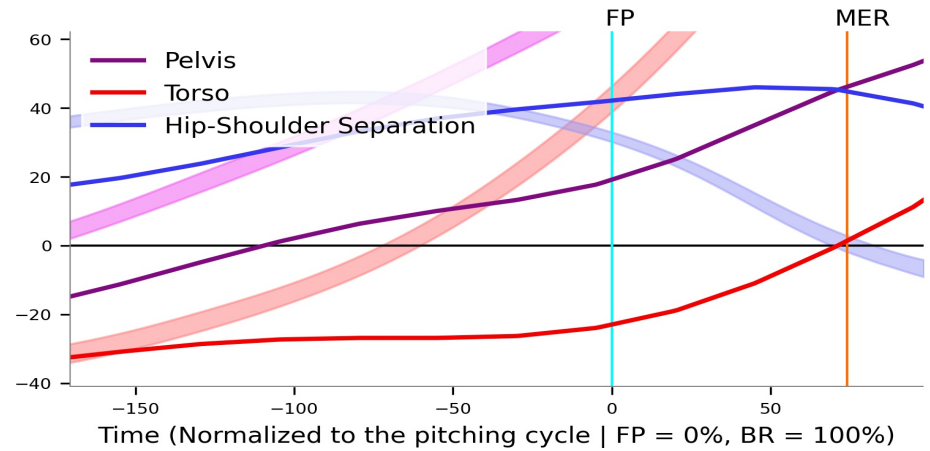


Trunk Kinematics

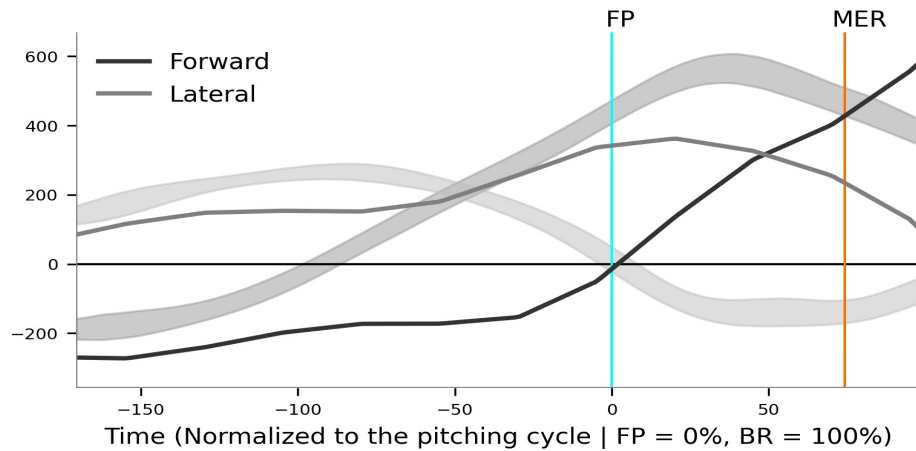
Trunk Flexion Angle (deg)



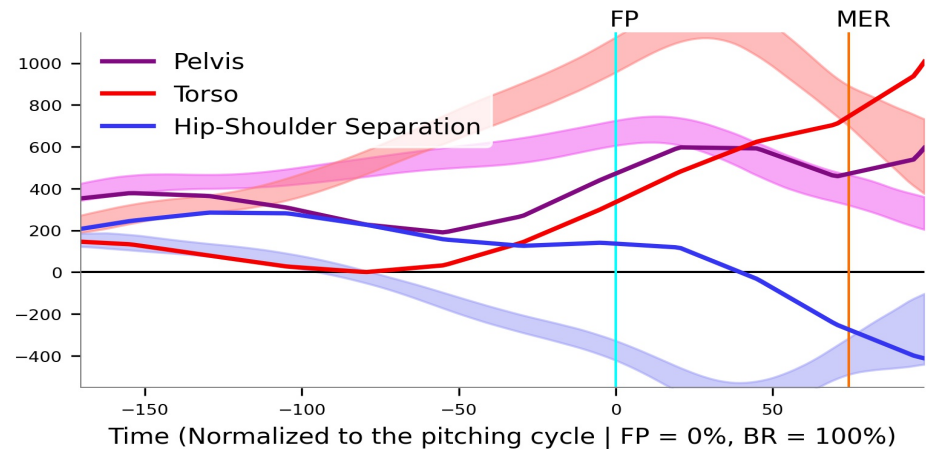
Trunk Twist Angle (deg)



Trunk Flexion Velocity (deg / sec)

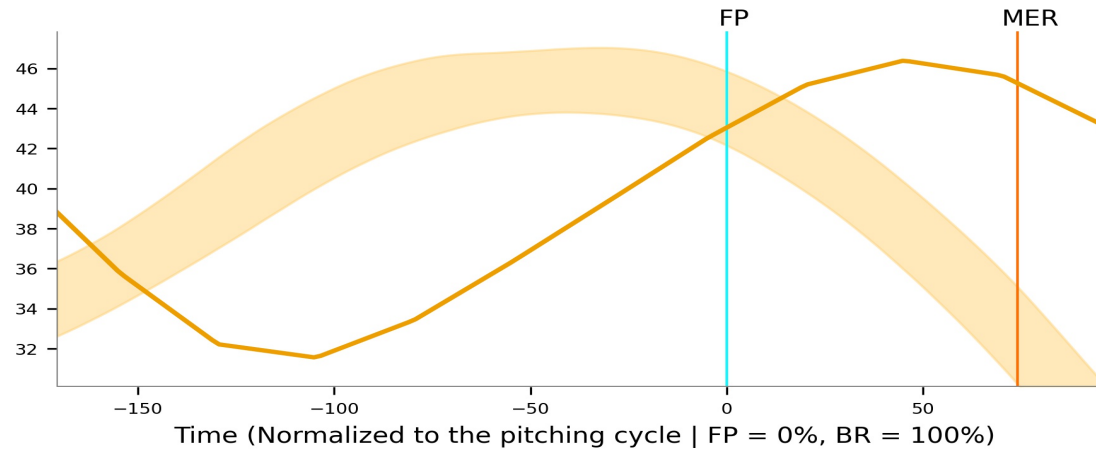


Trunk Twist Velocity (deg / sec)

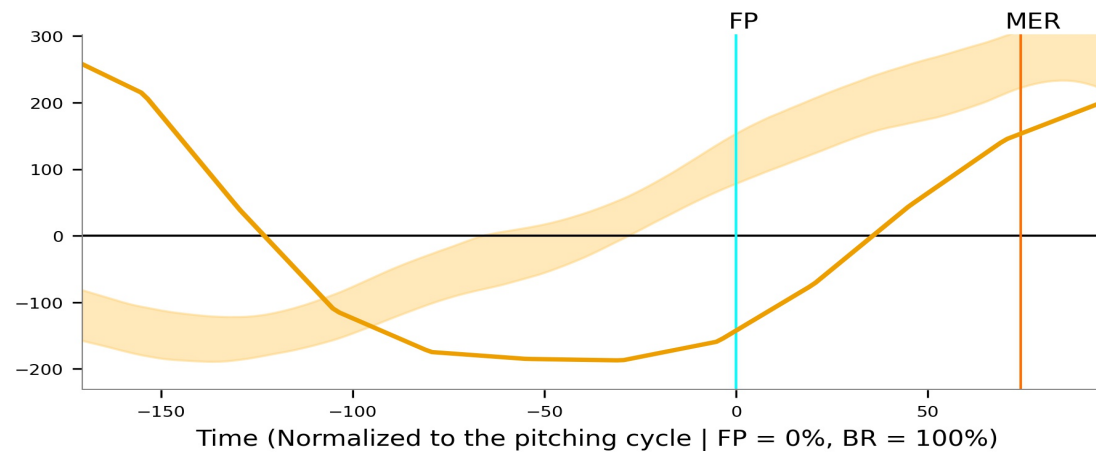


Knee Kinematics

Knee Flexion Angle (deg)

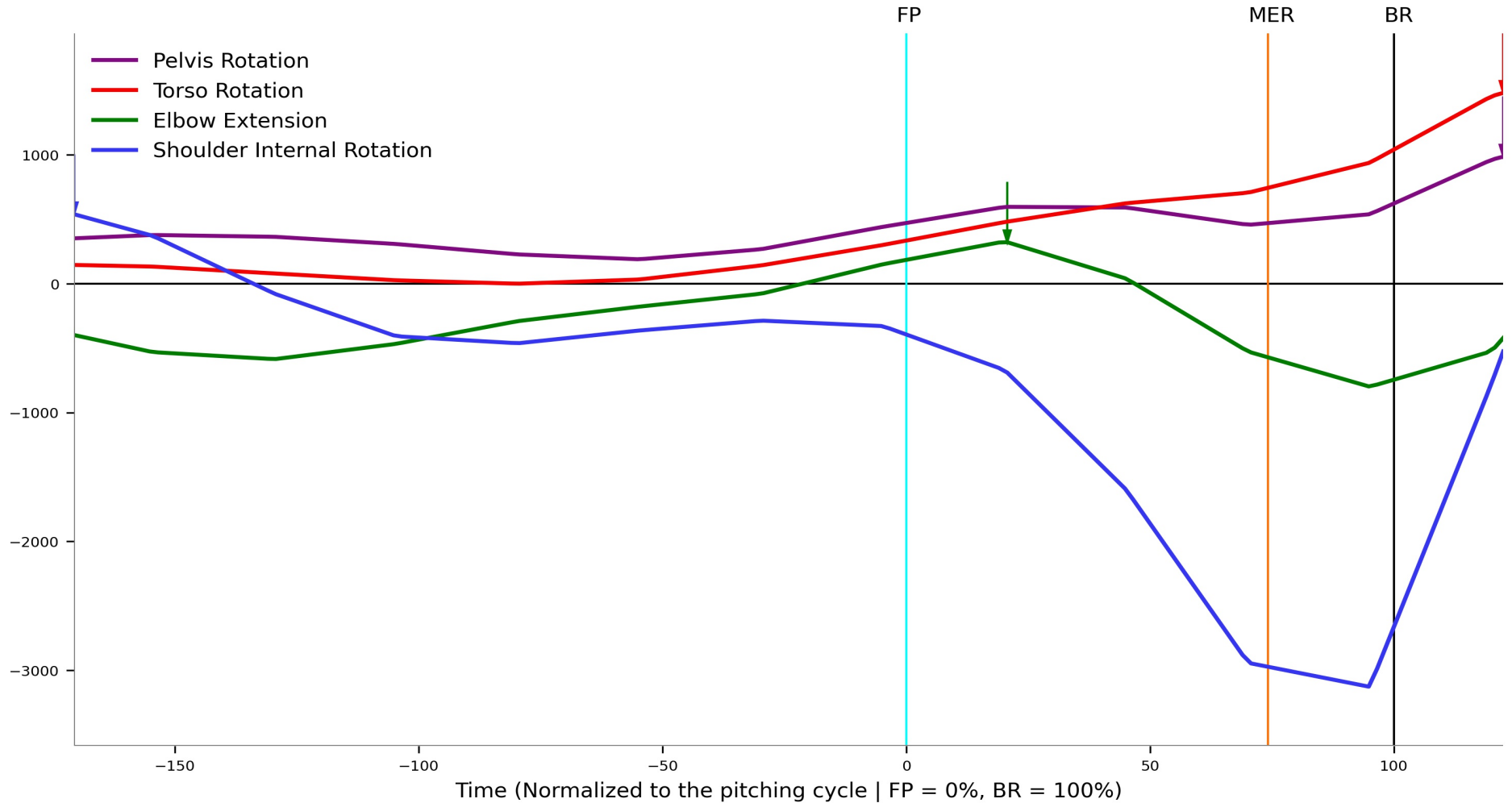


Knee Extension Velocity (deg / sec)



Kinematic Sequencing

Joint Angular Velocity Chain (deg / sec)





PitchAI Report Appendix

How to Read the Report

Page 1: Pitch Sequence Image Frames

The pictures on the title page are of the athlete throwing at 4 events throughout the Pitching sequence.

1. **Peak Leg Kick (PK)**
2. **Foot Plant (FP)**
3. **Maximum External Rotation (MER)**
4. **Ball Release (BR)**

Page 2 and 3: Arm Angle Kinematics Analysis (deg)

- **Elbow Flexion:**

Angle of elbow, fully extended is 0 deg

- > 90 deg at FP indicates "inside 90"
- If elbow flexion never gets to 90, it could lead to below average scap retraction as well as early forearm flyout later in the arm action

- **Shoulder External Rotation:**

Making a goal post with your arms is 90, rotating them forward moves towards 0

- Below 40 at FP could indicate arm drag
 - Maximum is typically 150-180, anything less could indicate mobility issue
- Note: a lower throwing velocity can reduce max shoulder rotation*

- **Shoulder Abduction:**

Raise your arms into a lateral raise. A T-pose is 90, arms at your side is 0

- Above 100 maximum could indicate elbow climb (inefficient)
- 90 at BR is average

- **Shoulder Horizontal Abduction:**

A T-pose is 0, moving behind you is positive

- We look for a maximum value ~40, with roughly ~35 at FP
- Around 0 at BR is average

The Graph:

- Look for shoulder abduction to stay pretty smooth and flat
- Look for shoulder horizontal abduction to decrease as external rotation increases

Page 4 and 5: Arm Angular Velocity Kinematics Analysis (deg/sec)

- **Elbow Extension Angular Velocity:**
 - How fast your elbow extends
 - 2000-2250 deg/s peak is average
- **Shoulder Internal Rotation Angular Velocity:**
 - How fast your shoulder internally rotates
 - 3000 deg/s peak is average
- **Shoulder Abduction Angular Velocity:**
 - How fast your shoulder abducts throughout the throw
- **Shoulder Horizontal Abduction Angular Velocity:**
 - How fast your shoulder horizontally abducts throughout the throw

The Graph:

- Look for elbow extension angular velocity to peak between MER and BR
- Look for shoulder internal rotation angular velocity to peak near BR

Page 6: Trunk Kinematics

- **Forward Trunk Flexion Angle (deg):**

Standing straight up is 0 deg, leaning backwards is negative, forwards is positive

- A positive value around 0 deg at FP is considered "stacked"
- Positive value at BR indicates "extension" towards home, 20-30 deg is average

- **Lateral Trunk Flexion Angle (deg):**

Standing straight up is 0 deg, leaning towards your lead leg side is positive

- "Over-the-top" pitchers generally have higher trunk tilt at BR (>15-35 deg)

- **Trunk Twist Angle (deg):**

Facing home plate is 90 deg, set position is 0 deg

- Want to avoid opening the trunk early into foot plant, meaning closer to 0 deg, 15-20 deg is average

- **Pelvis Angle (deg):**

Facing home plate is 90 deg, set position is 0 deg

- Want to be more open at foot plant, 45-55 deg average

- **Hip-Shoulder Separation (deg):**

Maximum degree of separation between pelvis and torso

- ~32 deg is average for a maximum value

The Graph:

- Look for maximum hip/shoulder separation to occur close to FP
- Look for front knee flexion to constantly decrease after FP (does not increase at all)



Page 7: Lead Leg Kinematics

- **Front Knee Flexion Angle (deg):**

Angle of knee, fully extended is 0 deg

- Amount of flexion should decrease from FP to BR

- **Front Knee Extension Angular Velocity (deg/s):**

- Max speed that your knee extends
- >360 deg/s is average

Page 8: Kinematic Sequencing Velocities

- **Pelvis Rotation Angular Velocity:**
 - Max speed that your hips rotate at
 - 650-750 deg/s is average
- **Torso Rotation Angular Velocity:**
 - Max speed that your torso rotates at
 - 1050-1150 deg/s is average
- **Elbow Extension Angular Velocity:**
 - How fast your elbow extends
 - 2000-2250 deg/s is average
- **Shoulder Internal Rotation Angular Velocity:**
 - How fast your shoulder internally rotates
 - 3000 deg/s peak is average

Notes:

- Pelvis angular velocity does not correlate strongly with throwing velocity
- Upper trunk angular velocity, elbow extension velocity, shoulder internal rotation velocity, and knee extension angular velocity maximums do correlate with throwing velocity

The Graph:

- Expanded version of the kinematics graph
- Arrows are color coded to when the respective peak velocities occur
- Peak pelvis angular velocity happens close to FP and before peak torso rotation velocity



Joint Angular Velocity Chain should follow the Kinematic Sequence

