Assessing Dominant Shoulder Range of Motion and Strength in Baseball Pitchers: What Does Pitch Count Tell Us?

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Introduction

- Baseball pitching induces significant mechanical stress on the throwing arm
- Chronic deficiencies in throwing arm strength and range of motion (ROM) has been associated with higher rates of dominant upper extremity injuries.
- Investigations into acute neuromuscular changes have shown decreases in internal rotation (IR) ROM, external rotation (ER) strength, and grip strength, but these findings have been tied to fixed innings/number of pitches thrown or in a simulated environment.
- Our objective is to investigate shoulder ROM, ER and IR strength, scaption strength and grip strength pre and post live-game outings with variable pitch counts to offer better insight into developing injury risk assessment and return-to-play guidelines tailored to individual pitch loads.

Methods

- Our study included 3,587 pitchers from ages 8 to 30 over a total of 28,616 games pitched.
- The ArmCare sensor and phone application was used to collect ROM and strength data from individual pitchers after warming up but before their live game outing and then again following their pitching outing.
- A linear regression analysis was performed using pitch count as the independent variable to assess the effect of pitch count on strength and ROM.

Data Collection

Figure 1. ArmCare Sensor data collection. A handheld dynamometer and inclinometer (Activebody Inc.) was used to collect data. Participants performed easy-to-follow instructions from the ArmCare phone application.

Strength Loss

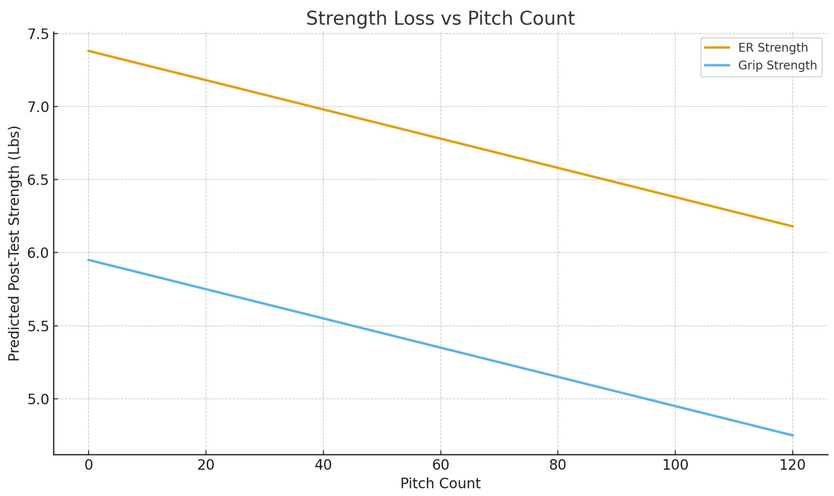

Figure 2. Strength loss per pitch thrown. ER strength is most correlated strength metric with chronic throwing arm deficiencies. Grip Strength estimates medial elbow stabilization.

Results

- For ER, IR, scaption, and chuck pinch strength, pitchers lost 0.1 pound of strength per every 10 pitches thrown.
- Neither IR nor ER ROM showed statistically significant change with pitch count but did show statistically significant yet minimal change when investigated purely pre- and post-game.

ROM Changes

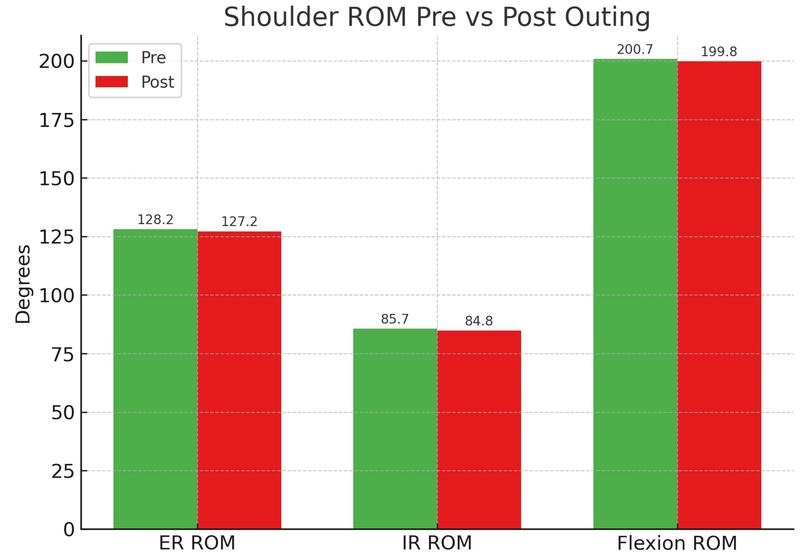

Figure 3. ROM Pre- & Post-Game. ER, IR, and flexion ROM data pre- vs post-game.

Conclusion

- Our findings suggest a generalized rate of strength lost per pitch that can be held as a standard to which individual players can be assessed both mid-game and between games to assess their recovery back to baseline strength.
- ROM data suggests ROM deficiencies leading to injury accumulate over the course of a season or career rather than an individual game.
- Future directions include garnering data 24 hours post-game and beyond to more accurately measure strength recovery.

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