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“Influence of Pitch Count on Throwing Arm Strength and Range of Motion”

BACKGROUND: Pitching a baseball places considerable mechanical stress on the throwing arm, resulting in dynamic shifts in both range of motion and muscular strength. These changes are used in modern baseball as a metric of fatigue and recovery. Specifically, increase in external rotational range of motion (ER ROM), decrease in internal rotational range of motion (IR ROM) decrease in IR and ER strength of the shoulder, decrease in scaption strength, and a decrease in chuck pinch strength. These changes have been well documented across long-term, multi-season studies, single-season observations, and recordings from single simulated 60-pitch games, all aimed at predicting injury risk and informing preventative strategies for pitchers. Across youth, collegiate, and professional baseball, pitch counts vary considerably depending on the context of the game and starter/reliever roles. This variability highlights the need to examine pitch-to-pitch changes in these key metrics to inform individualized recovery protocols based on pitch count.

OBJECTIVE: The objective of this study is to determine the rate of change in throwing arm metrics relative to pitch count, with the goal of accurately predicting the recovery time and regimen required before a subsequent pitching outing.

METHODS: 3,587 university level and above pitchers participated in this study, totaling 28,616 live game outings. Using a handheld dynamometer and inclinometer the participants were given instruction to measure internal rotational (IR) range of motion (ROM), external rotational (ER) ROM, IR strength, ER strength, scaption strength, and chuck pinch strength before and after multiple pitching outings. The data collected was then synthesized to find a linear regression with pitch count as the independent variable.

RESULTS: The data analysis of these measurements demonstrated a linear relationship between pitch count and strength metrics. Neither IR nor ER ROM showed statistically significant change with pitch count. For ER, IR, scaption, and chuck pinch strength, pitchers lost an average of 0.01 pounds of strength per pitch, or 1 pound of strength per every 100 pitches thrown.

CONCLUSION: These findings show that pitchers experience a predictable, average loss of 0.01 pounds of strength for every pitch thrown. Comparing an individual pitcher's strength decline to this benchmark may help identify those experiencing disproportionate fatigue, signaling a higher risk of injury and the need for adjusted recovery or workload management.

