

What does the assessment of the upper-body stretch-shortening cycle reveal about baseball pitchers' biomechanical workload and game performance?

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Summary

Current practices for monitoring biomechanical workload in baseball pitchers, such as in-game tracking of pitch counts and velocity, fail to account for non-competitive throws, limiting the understanding of pitchers' true physical readiness. This study investigates the relevance of a supine medicine ball throw protocol to assess the upper-body stretch-shortening cycle (SSC) during the eccentric and concentric movement phases and to explore their associations with game statistics. Twenty male pitchers completed three maximal throws pre- and post-game using a medicine ball with an embedded accelerometer. Paired t-tests revealed a significant decrease in pre- and post-game eccentric peak velocity score highlighting sensitivity to neuromuscular fatigue accumulation in baseball pitchers in this movement phase. No significant associations were found between relative changes in pre- and post-game eccentric and concentric phases and game statistics. These findings suggest that the upper-body SSC appears to be promising for monitoring baseball pitcher's workload.

Introduction

Workload monitoring in baseball pitchers primarily rely on pitch counts and velocity tracking during games. However, these methods only account for pitches thrown at high intensity in competition, which limits the ability to make informed decisions about a pitcher's readiness to throw [1,2]. This study aims to investigate the usefulness of a supine medicine ball throw protocol in assessing the upper-body SSC of baseball pitchers to quantify their physical readiness. A secondary objective is to explore the associations between the upper-body SSC movement phases relative changes in peak velocity scores pre- and post-game and pitchers' game statistics performance.

Methods

Twenty male baseball pitchers (mean age: 16.65 ± 1.04 years; height: 1.84 ± 0.54 m; weight: 91.80 ± 18.19 kg) were recruited for this study. A repeated-measures design was used to evaluate pre- and post-game upper-body eccentric and concentric peak velocity performance ($\text{m}\cdot\text{s}^{-1}$). The *MoveFactorX* medicine ball was used to assess the supine medicine ball throw protocol. Three throws at maximal capacity were recorded before the game and three throws at maximal capacity were recorded immediately after their pitching performance. Pitchers' game statistics were retrieved from the *GameChanger* application (e.g. pitch counts, balls

thrown, strikeouts, walks). Paired t-tests were conducted to compare pre- and post-game eccentric and concentric peak velocity scores. Spearman's correlations were used to analyze relationships between the relative changes in pre- and post-game eccentric and concentric peak velocity scores and game statistics performance. Statistical significance was set at $p < 0.05$.

Results

Figure 1 presents the significant change (decrease) in pre- vs post-game eccentric peak velocity scores. Pre- and post-game concentric peak velocity showed a non-significant and variable decrease or increase in performance among pitchers. No associations were found between pre- and post-game SSC movement phases relative changes and game statistics.

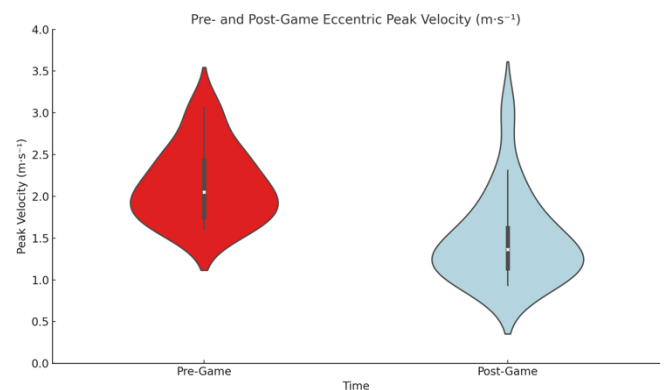


Figure 1: Changes in Pre- and Post-Game Eccentric Peak Velocity ($\text{m}\cdot\text{s}^{-1}$).

Conclusions

To conclude, the assessment of the upper-body SSC seems to be a promising evaluation for monitoring pitcher biomechanical workload and informing decisions about their true physical readiness to throw. The eccentric phase of the SSC appears to be more sensitive to neuromuscular fatigue compared to the concentric phase.

Acknowledgments

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References

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