



CHANGES IN COUNTERMOVEMENT JUMP PERFORMANCE ACROSS THE TRAINING YEAR IN DIVISION I SOFTBALL

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PURPOSE

Monitoring lower-body power and neuromuscular readiness throughout the training year is critical for optimizing athletic performance and minimizing injury risk. Countermovement jump (CMJ) assessments have been widely utilized in applied sports science to evaluate these physiological attributes. This study analyzed seasonal CMJ data from a Division I softball team, with weekly CMJ assessments conducted across an entire training year.

METHODS

Subjects included 23 Division I softball players (age = 21.35 ± 1.56). Three CMJ assessments on force plates were collected weekly for 27 sessions throughout the training year. Testing occurred periodically under consistent conditions. Each segment consists of the same number of CMJ assessments. Segment 1 and Segment 2 were during the off-season, while Segment 3 and Segment 4 were in-season. Metrics calculated from the force plates included jump height, eccentric braking rate of force development (RFD), braking phase duration, peak and mean concentric force, and modified reactive strength index (mRSI). Repeated-measures analyses of variance were conducted between segments for each metric, with an alpha value of 0.05.

CONCLUSION

These findings highlight important changes in lower-body performance among Division I softball athletes. Improved CMJ metrics in later-season segments may indicate a successful strength and conditioning program to improve and/or maintain performance throughout the training year. Decreasing braking phase duration could indicate a more efficient stretch-shortening cycle, especially in off-season periods. However, the declines in jump height, eccentric RFD, and mRSI demonstrated in the present study may reflect accumulated fatigue throughout a softball season. No significant differences were seen in mean or peak forces throughout the competitive season, which may reflect a change in neuromuscular characteristics or jumping strategy often seen during acute fatigue. Practitioners should consider these trends when designing training strategies and programs to balance performance and recovery.

- Braking phase duration significantly decreased during pre-season, indicating improved neuromuscular efficiency
- Jump height, eccentric braking RFD, and mRSI decreased in-season, suggesting accumulated fatigue
- CMJ tracking can help track athlete readiness and adjust programming

PRACTICAL APPLICATIONS

Sports scientists and strength and conditioning professionals can use CMJ assessments across a competitive season to track athlete readiness, help adjust programming, and mitigate injury risk. Regular monitoring of jump mechanics and force-time variables can provide insights into overall fatigue, readiness, and adaptations, aiding in evidence-based decision-making for athlete performance management. Since certain phases of the training year are more demanding than others, acute declines in performance may be expected as long as principles of progressive overload are followed to maximize long-term adaptations.

RESULTS

Braking phase duration decreased from Segment 1 to Segment 2 ($p = 0.005$) and from Segment 1 to Segment 3 ($p = 0.002$). Jump height decreased from Segment 1 to Segment 4 ($p = 0.007$). Eccentric braking RFD decreased from Segment 2 to Segment 3 ($p = 0.004$). mRSI decreased from Segment 2 to Segment 4 ($p = 0.029$).

