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Lower extremity kinematic and temporal changes in adolescent baseball pitchers during a simulated game

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Abstract

Aim: To investigate whether adolescent baseball pitchers change lower extremity kinematic and temporal parameters during a simulated game, which may affect performance outcomes.

Method: Twelve male adolescent pitchers (14 – 16 years) threw 90 pitches (6 sets of 15 pitches) from an artificial mound towards a pitching net. Angular displacements, angular velocities and temporal parameters at the hip, knee and ankle of the trailing and leading legs were collected throughout the pitching cycle. Dependent variables were analysed from the balance position through to maximal internal rotation of the shoulder. Performance outcomes of ball velocity and pitching accuracy were also recorded. The last five pitches of the second and final sets were compared to determine whether changes in the pitching mechanics and performance outcomes had occurred by the end of the simulated game. Results: Pitchers assumed a less upright posture and the leading leg was not raised as high at the balance position in the final set. Throughout stride phase, pitchers decreased maximal hip extension and ankle plantarflexion displacements in the trailing leg. Additional decreases in the maximal angular velocities for hip abduction and knee extension were seen throughout the stride phase in the final set. Foot contact occurred earlier in the final set, resulting in decreased hip flexion and increased hip abduction in the leading leg. No kinematic differences were observed between sets at ball release. Ball velocity and pitching accuracy decreased in the final set.

Conclusion: Kinematic differences in the lower extremities suggest that lower extremity musculature may have been affected by fatigue by the end of the simulated game. Consequently, pitchers may have produced less forward momentum during the final set of pitches, which could have contributed to the decreased ball velocity. The altered balance position seems to be the underlying factor for the subsequent changes in the lower extremity pitching mechanics. Therefore, the leading leg hip flexors and the trailing leg hip and knee extensors may require strengthening to maintain the balance position.
strengthening of the ankle plantarflexors would assist the hip and knee in producing consistent propulsive forces during the stride phase throughout a game.
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Ethics approval was obtained through the Hospital for Special Surgery Institutional Review Board.
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