Changes in Joint Work across Consecutive Seasons in Collegiate Cross Country Runners
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Running mechanics are known to change with age and years of experience, however the extent to which mechanics may change more acutely from one year to the next is uncertain. In particular, refinements of running mechanics may occur which benefit an individual’s performance or reduce injury risk.

Purpose: To assess changes in lower extremity joint work during running across two consecutive seasons among healthy collegiate runners.

Methods: Pre-season data from the 2015 and 2016 cross country seasons were reviewed for 14 NCAA Division I runners (men, 7; age: 20.1±1.1 yr; height: 1.7±0.1 m; mass: 61.6±8.8 kg). Athletes were healthy at both testing sessions. Ground reaction forces and kinematic data were recorded during treadmill running (4.47m/s). Sagittal plane positive (PW) and negative work (NW) were calculated for the hip, knee, and ankle during stance phase and averaged across gait cycles. PW and NW at each joint were then compared across seasons using paired t-tests. Training programs and injuries occurring between testing sessions were also reviewed.

Results: No differences between limbs were observed (p > 0.13); analyses are reported for the right limb. At the start of the 2015 season, PW at the hip, knee, and ankle was 0.26±0.10, 0.33±0.08 and 1.31±0.21 J/kg, respectively, and NW was -0.04±0.04, -0.45±0.11, and -0.83±0.29 J/kg, respectively. At the start of the 2016 season, PW at the hip, knee, and ankle was 0.38±0.14, 0.25±0.25 and 1.30±0.23 J/kg, respectively, and NW was -0.05±0.05, -0.39±0.09, and -0.86±0.31 J/kg, respectively. Hip PW increased significantly and both knee PW and NW decreased significantly (p < 0.006) across seasons. No significant differences between seasons were observed in ankle PW or NW (p > 0.42) or in hip NW (p = 0.43). Results remained consistent when comparing those who did and did not sustain an injury between 2015 and 2016, and no changes in training programs were noted.

Conclusion: Hip PW and knee PW and NW changed significantly between seasons, indicating an alteration in running mechanics that may affect performance. In the absence of injury and training-related modifications, the mechanism responsible for these changes requires further exploration.