

ORIGINAL RESEARCH

INFLUENCE OF INJURY ON DYNAMIC POSTURAL CONTROL IN RUNNERS

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ABSTRACT

Background: Injury has been linked with altered postural control in active populations. The association between running injury and dynamic postural control has not been examined.

Hypothesis/Purpose: The purpose of this study was to examine dynamic postural control in injured and uninjured runners using the Star Excursion Balance Test (SEBT), Time to Stabilization (TTS) of ground reaction forces following a single-leg landing, and postural stability indices reflecting the fluctuations in GRFs during single-leg landing and stabilization tasks (forward and lateral hop). It was hypothesized that dynamic postural control differences would exist between runners with a history of injury that interrupted training for ≥ 7 days (INJ) when compared to runners without injury (CON).

Design: Case-control study

Methods: Twenty-two INJ (14 F, 8 M; 23.7 ± 2.1 y; 22.3 ± 2.8 kg/m²; 29.5 ± 16.3 mi/wk) currently running $>50\%$ pre-injury mileage without pain were compared with twenty-two matched CON (14F, 8M; 22.7 ± 1.2 y; 22.7 ± 2.7 kg/m²; 31.2 ± 19.6 mi/wk). INJ group was stratified by site of injury into two groups (Hip/Thigh/Knee and Lower Leg/Ankle/Foot) for secondary analysis. Leg length-normalized anterior, posterolateral, and posteromedial reach distances on the SEBT, medial/lateral and anterior/posterior ground reaction force TTS, directional postural stability indices, and a composite dynamic postural stability index (DPSI), were assessed using mixed model ANOVA ($\alpha=0.05$) and effect sizes (d).

Results: No group X direction interaction or group differences were observed for the SEBT ($p=0.51, 0.71$) or TTS ($p=0.83, 0.72$) measures. A group X direction interaction was found for postural stability indices during the forward landing task ($p<0.01$). Both Hip/Thigh/Knee and Lower leg/Ankle/Foot INJ groups demonstrated a greater vertical postural stability index (VPSI) ($p=0.01$ for both, $d=0.80, 0.95$) and DPSI ($p=0.01, 0.02, d=0.75, 0.93$) when compared to CON suggesting impaired balance control. A group X direction interaction was also found for postural stability indices during the lateral landing task ($p=0.03$). Only the Hip/Thigh/Knee INJ runners displayed a greater VPSI ($p=0.01, d=0.91$) and DPSI ($p=0.017, d=0.89$) when compared to CON.

Conclusions: When compared to CON, INJ runners demonstrated impaired dynamic control of vertical forces when performing the single leg landing and stabilization tasks. Clinicians should consider addressing dynamic control of vertical loads through functional tasks during the rehabilitation of running injury.

Level of Evidence: Level 3

Keywords: Dynamic postural stability index, Star Excursion Balance Test, Time to Stabilization

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