ABSTRACT

**Background:** While cross-country running is a popular interscholastic sport, it also has a high incidence of running-related injuries (RRIs). Recent literature suggests that functional tests may identify athletes at increased risk of injury. The Y-Balance Test (YBT) is an objective measure used to assess functional muscle strength, balance, and expose asymmetries between tested limbs.

**Purpose/Hypothesis:** The purpose of this study was to determine if the YBT could predict RRI in high school cross-country runners. It was hypothesized that an asymmetric right (R)/left (L) YBT reach distance for the lower or upper extremities would be associated with an increased risk of RRI.

**Study Design:** Prospective observational cohort

**Methods:** One hundred forty-eight athletes (80 girls, 68 boys) who competed in interscholastic cross-country in Southern California during the 2015 season participated in the study. Prior to the cross-country season, the runners completed Lower-Quarter YBT (LQ-YBT) and Upper-Quarter YBT (UQ-YBT) testing to assess lower and upper extremity asymmetry, respectively. The runners were prospectively monitored for RRI occurrence throughout the season using the Daily Injury Report form.

**Results:** Forty-nine runners (33.1%) incurred a RRI during the 2015 season, with the lower leg (shin/calf) and knee the most common RRI sites. Girls had a higher RRI occurrence (38.8%) than boys (26.5%) \((p = 0.12)\). Boys had greater raw scores for LQ-YBT R and L anterior (ANT), posteromedial (PM), posterolateral (PM) and composite reach distances than girls \((p < 0.05)\). With the exception of normalized superolateral reach distance, boys had significantly greater scores for raw and normalized R and L UQ-YBT reach distances and raw composite scores than girls \((p < 0.05)\). After adjusting for prior RRI, while boy runners with a LQ-YBT PM reach difference ≥4.0 cm were five times more likely to incur a RRI \((\text{AOR} = 5.05, 95\% \text{ CI: 1.3-19.8}; p = 0.02)\), girl runners with a UQ-YBT inferolateral (IL) reach difference ≥4.0 cm were 75% less likely to incur a RRI \((\text{AOR} = 0.25, 95\% \text{ CI: 0.1-0.7}; p = 0.005)\). By lower extremity body region, boy runners with a UQ-YBT superolateral (SL) reach difference ≥4.0 cm were seven times more likely to incur a hip/thigh/knee RRI \((\text{AOR} = 7.20, 95\% \text{ CI: 1.1-45.6}; p = 0.002)\).

**Conclusion:** Greater lower extremity (PM) or upper extremity (SL) reach distance asymmetry, as measured by the LQ-YBT or UQ-YBT, respectively, were associated with RRI in boy high school cross-country runners.

**Level of Evidence:** 2b

**Keywords:** Asymmetry, cross-country, high school, prospective, running-related injury, Y-Balance Test

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The study was approved by the Human Subjects Division at San Diego State University.

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