

Kinetic Asymmetry in Female Runners With and Without Retrospective Tibial Stress Fractures

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The tendency for a runner to become injured on a particular side is not well understood. It has been suggested that it may be due, in part, to asymmetry in their mechanics.

PURPOSE: The purposes of this study were (1) to compare the levels of kinetic asymmetry in runners who have previously sustained a tibial stress fracture (TSF) and those who have not (CON) and (2) to compare loading parameters between the involved and uninvolved sides of the TSF runners. It was hypothesized that the TSF group would be more asymmetric than the CON group and that they would exhibit greater loading on the involved side. **METHODS:** Twenty-five CON and 24 TSF subjects were eligible for this study. CON subjects reported to have never sustained a running injury. TSF subjects were included if they had sustained one or more tibial stress fractures on a single side of their body. Subjects were asked to run along a 25 meter runway at a speed of 3.65 m/s (\pm 5%), striking a force platform (Bertec Corp., Worthington, OH) at its center. Data were sampled at 960 Hz. The speed was monitored with photoelectric cells placed 2.86 m apart. Five trials were collected for both the left and right sides. Any trials indicative of targeting were discarded. The same type of neutral running shoe was worn by each subject during data collection. Peak medial, lateral, braking, vertical impact, and vertical ground reaction forces, average and instantaneous vertical loading rates, and peak shock were measured in each subject. Symmetry Index (SI) was used to quantify asymmetry: $SI = (X_L - X_R) / 0.5 * (X_L + X_R)$. A 1-tailed, independent t-test was used to compare SI values between the TSF and CON groups. A 1-tailed, dependent t-test was used to compare loading values between the involved and uninvolved sides of the TSF group. **RESULTS:** SI values were not significantly different between the CON and TSF groups for any of the parameters. The peak vertical impact ground reaction force and peak shock were both significantly higher on the involved side in the TSF subjects ($p = 0.04$ and 0.02 respectively). **CONCLUSIONS:** These results indicate that while CON and TSF subjects have similar levels of asymmetry, those in the TSF group may have elevated loading values, bilaterally, that predispose them to injury.