

## KINETIC VARIABLES IN SUBJECTS WITH PREVIOUS LOWER EXTREMITY STRESS FRACTURES

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Overuse injuries are common among competitive runners with stress fractures being one of the most serious injuries runners sustain. Females are twice as likely to experience a stress fracture as their male counterparts. The etiology of stress fractures is multifactorial in nature but is related, in part, to some combination of peak forces and loading rate as well as shock experienced by the lower extremity. However, few studies have quantified these factors in competitive female distance runners.

**PURPOSE:** To examine differences in ground reaction force (GRF) variables and tibial acceleration between competitive female distance runners who had sustained a previous lower extremity stress fracture (SF) and uninjured control subjects (CON).

**METHODS:** Ten CON and 10 SF subjects ran along a 25m runway at a speed of 3.7 ( $\pm 0.2$ ) m/s. GRF and tibial acceleration data were recorded from 5 trials. Peak positive tibial acceleration (PPA), peak to peak acceleration (PTP), peak vertical GRF (VGRF), stiffness, and instantaneous and average loading rate (ILR/ALR) were determined.

**RESULTS:** SF subjects exhibited 22% greater PPA (9.24g vs 7.16g;  $p=0.05$ ), 26% greater PTP (13.43g vs 9.97g;  $p=0.03$ ), 36% greater VGRF (3.87BW vs 2.48BW;  $p=0.01$ ), 32% greater ILR (158.61BW/s vs 108.89BW/s;  $p=0.03$ ), and 34% greater ALR (117.93BW/s vs 77.52BW/s;  $p=0.03$ ) as compared to CON. No differences in stiffness (8.67kN/m vs 8.74kN/m;  $p=0.62$ ) were observed between the two groups.

**CONCLUSION:** Based on the results of this study, subjects who had previously sustained a lower extremity stress fracture exhibited significantly greater GRF values and tibial acceleration. Repetitive exposure to these forces may have predisposed these subjects to overuse-related stress fracture injuries. However, prospective studies are essential to determine whether the observed increases in these kinetic variables were present prior to the stress injury.

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