INFLUENCE OF SHOE-SURFACE INTERACTIONS ON REARFOOT MOTION DURING RUNNING

J. Hamill*, B.T. Bates**, K.G. Holt***, H. Davis**

ABSTRACT

* Biomechanics Laboratory, University of Massachusetts, USA.
** Biomechanics Laboratory, University of Oregon, USA.
*** Motion Analysis Laboratory, Boston University, USA.

It has been documented that running shoes influence rearfoot motion and it has also been suggested that excessive rearfoot motion can lead to injury. The effect to the hardness of the running surface on rearfoot motion, however, has not been previously addressed. The purpose of this study was to determine the influence of shoe midsole hardness and running surface hardness on rearfoot motion.

Five young adult male recreational runners served as subjects. Two pairs of running shoes (durometers 45 and 70 on a shore A scale) were used in the study. The subjects ran on a treadmill that simulated soft, neutral and firm surface hardnesses. The order of the presentation of conditions was randomized across surface within each shoe condition. A 200 Hz video camera interfaced to a video processor was located to obtain a frontal plane rear view of the lower extremity. Five trails of each condition for each subject were digitized and then digitally filtered.

Rearfoot angles were generated and rearfoot angular velocity was calculated using a finite difference method. Variables describing the rearfoot angle and angular velocity-time profiles were then calculated. Five trial mean values of each parameter for each subject/shoe/surface condition were analyzed using a two-way repeated measures ANOVA. Significant differences were found between shoes for 3 variables with the softer midsolc shoe having greater eversion angles, lower velocities and longer times to maximum velocity.

None of the surface conditions nor the shoe-surface interactions were statistically significant. The implication of these findings is that the midsole stiffness of the shoe has a more pronounced influence on rearfoot motion than the stiffness of the running surface.