

THE INFLUENCE OF GROUND CONTROL FOOTWEAR ON KNEE JOINT MOMENTS DURING RUNNING

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KEY WORDS: injury, shoe, running.

INTRODUCTION: Subjects who developed patellofemoral pain syndrome during running had higher internal knee abduction and external rotation moments than asymptomatic subjects (Stefanyshyn et al., in press). Footwear can significantly influence joint moments at the knee and ankle (Mündermann et al., 2003). Therefore, it was speculated that footwear could be developed specifically to reduce knee joint moments, primarily in the transverse and frontal planes. New prototypes were developed to allow the foot to displace both in a medial-lateral and anterior-posterior direction relative to the outsole. The purpose of this study was to determine if the prototype footwear allowing relative movement between the foot and outsole would reduce three-dimensional knee joint moments during running.

METHOD: Eleven male subjects participated in this study. Data were collected while they ran with different shoe conditions at speeds of 3 and 5m/s. The shoe conditions consisted of a fixed (control) and functional version of the prototypes. Kinetic data were collected at 2400 Hz and kinematic data were collected simultaneously at 120 Hz. Spherical reflective markers were placed on the thigh, shank and shoe. Five trials were collected for each condition and prior to calculation of any variables, the kinematic and the kinetic data were filtered with a fourth-order low-pass Butterworth filter. Internal knee joint moments were calculated using an inverse dynamics analysis. Paired student T-tests were performed to compare between the shoes with functional and fixed systems. The α -level chosen was 0.05.

RESULTS AND DISCUSSION: There was a significant reduction of about 11% in peak knee abduction moments with the functional shoe while running at 3m/s. All 11 subjects had a reduction while running at the slow speed. Eight of the eleven subjects also had a reduction while running at 5m/s but on average, the reduction was not significant. The functional shoe significantly reduced the external rotation moments at the knee during running at 3m/s. The reduction was approximately 18%. There was also a trend toward reduced external rotation moments during fast running.

CONCLUSION: Since high knee abduction and external rotation moments have been proposed to be associated with patellofemoral pain syndrome, the decreased moments with the new prototype shoes may help in preventing running related injuries.

REFERENCES:

- Mündermann et al. (2003) Foot orthotics affect lower extremity kinematics and kinetics during running. *Clinical Biomechanics*, 18, 254-262.
Stefanyshyn et al. (in press) Knee angular impulse as a predictor of patellofemoral pain in runners *American Journal of Sports Medicine*.

Acknowledgement:
adidas International.