THE EFFECTS OF AN OVER-THE-COUNTER ORTHOTIC ON LOWER EXTREMITY KINEMATICS IN RECREATIONAL RUNNERS

Ahmed Alzahrani, Aric Warren, and Robert Gregory
Biomechanics Laboratory, University of Kansas, Lawrence, KS, USA

INTRODUCTION: Abnormal foot mechanics during the stance phase of running may affect the kinematics of the lower extremities and predispose an individual to injuries of the foot, ankle, and knee. Custom made foot orthotics are often prescribed to correct abnormal mechanics during running by restoring dynamic stability to the closed chain of the lower extremity. However, custom made orthotics are expensive and must be made by a specially trained professional. An alternative to custom made orthotics are several brands of over-the-counter orthotics. However, there has been no research done to examine the efficacy of using an over-the-counter orthotic to correct abnormal gait mechanics. The purpose of this study was to examine the effects of an over-the counter orthotic on ankle and knee joint kinematics during running in individuals identified as excessive pronators.

METHODS: Eight male and female college-age recreational runners identified as being excessive pronators participated in this study. Subjects were required to perform two testing sessions in which the subjects ran with and without orthotics. The orthosis used in this study was a soft orthotic marketed under the Flat Foot brand name (Marathon Shoe Co.). During both testing sessions, the subjects were required to run on a treadmill at a velocity of 3.35 m/s. A three-dimensional motion capture system was used to record the position of light emitting diodes placed on the foot, shank, and thigh segments for five complete gait cycles. Range of motion, peak angular velocity, and peak angular acceleration at the ankle and knee joints were calculated for the frontal, sagittal, and transverse planes of motion. A paired t-test was used to analyze the effects of the orthotic for all kinematic variables.

RESULTS AND DISCUSSION: No differences between the orthotic and non-orthotic conditions were found for ankle joint kinematics (range of motion, peak angular velocity, and peak angular acceleration) in the frontal, sagittal, and transverse planes of motion. One important finding to note is that there was no significant difference in the amount of pronation between the orthotic condition (4.1 2.7) and the non-orthotic condition (3.5 2.8). This contradicts the common finding that soft orthotics reduce pronation (Eng & Pierrynowski, 1994; Smith et al., 1986). In addition, no differences between the orthotic and non-orthotic conditions were found for knee joint kinematics (range of motion, peak angular velocity, and peak angular acceleration) in the frontal and sagittal planes of motion. However, there was a significant ($p < 0.05$) increase in transverse plane motion in the orthotic condition (4.6 2.9) as compared to the non-orthotic condition (1.7 1.2). Increased knee joint motion when using soft orthotics during running has also been documented by Eng & Pierrynowski (1994).

CONCLUSION: The results show that the over-the-counter orthotic used in this study was not effective in altering the lower extremity kinematics during running in individuals identified as excessive pronators. It can be concluded that over-the-counter orthotics provide mostly cushioning and little, if any, functional control. For individuals with gait pathomechanics, the use of a custom made rigid or semi-rigid orthotic may be necessary.

REFERENCES:

Eng, J.J., & Pierrynowski, M.R. (1994). The effect of soft foot orthotics on three-dimensional lower-limb kinematics during walking and running. Physical Therapy, 74, 836-843.

Smith, L.S., Clarke, T.E., Hamill, C.L., & Santopietro, F. (1986). Effects of soft and semi-rigid orthoses upon rearfoot movement in running. Journal of the American Podiatric Medical Association, 76, 227-233.