THE INFLUENCE OF A CUSTOM FOOT ORTHOTIC INTERVENTION ON LOWER EXTREMITY KINEMATICS AND KINETICS DURING RUNNING

Christopher L. MacLean and Joseph Hamill
Biomechanics Laboratory, University of Massachusetts-Amherst, Amherst, Massachusetts, USA
E-mail: cmaclean@excsci.umass.edu

INTRODUCTION

Custom foot orthoses (CFOs) are frequently prescribed in the management of lower extremity overuse running injuries. It is generally accepted that this treatment modality leads to positive clinical outcomes (D’Ambrosia, 1985, Gross et al., 1991). However, what is not well understood is how mechanical aspects of CFO intervention contribute to positive clinical outcomes. The purpose of the current investigation was to quantify how CFOs affect the 3-dimensional (3-D) kinematics and kinetics of the lower extremity in a sample of female runners who exhibit within normal limits (WNL) maximum ankle eversion angle.

METHODS

Eight healthy female (age: mean = 23.75 years, mass = 56.46 kg) recreational and competitive runners were selected for participation in the study. Subjects exhibiting a peak ankle eversion angle of <15 degrees were included in the study. Each subject performed 5 overground running trials with (CFO) and without (SHO) custom foot orthoses (Paris Orthotics Lab, Vancouver, BC, Canada).

Kinematic data were collected using Qualisys® software (Glastonbury, CT, USA) at 200Hz and kinetic data were collected using an AMTI® force platform (Watertown, MA, USA) at 1000Hz. Data were reduced using a MatLab program and processed using Visual 3D® (C-Motion, Inc. Rockville, MD, USA) for the calculation of ankle and knee angles and internal joint moments.

RESULTS AND DISCUSSION

Custom foot orthotic intervention resulted in significant increases in peak values for ankle abduction moment, knee adduction angle (Figure 1B), knee abduction (Figure 2B) and internal rotation moments (p<0.05). The results of this study reveal that 3-D frontal plane kinetics and kinematics of the ankle were unaffected by CFO intervention in healthy subjects who exhibit WNL peak ankle eversion angle (Figures 1A & 2A). Investigators may want to reconsider including subjects of this description in further research, as they are not generally candidates for this intervention.

In addition, the observed increase in knee frontal plane kinematics and kinetics (Figures 1B & 2B) may indicate that the prescription of such devices in subjects of this description may perturb the knee in an unhealthy manner by increasing adduction angle and internal abduction moment (Maly et al., 2002, McIntyre et al., 1991, Noyes et al., 1992). Further research is required to investigate similar parameters in subjects who have a prior history running injury and who exhibit excessive ankle eversion during running.

REFERENCES