BIOMECHANICAL ANALYSIS OF MERIDIAN ELYTE SHOE IN WALKING AND RUNNING

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Background: The Meridian Elyte was designed to have positive inclination and to increase the moment arm and joint torque at the ankle during the plantar flexion. The manufacturer claims that this unique shoe design would increase the load placed on the calf muscles, thus producing training effects.

Purpose: The purpose of this study is to investigate the biomechanical characteristics of the Meridian Elyte during walking and running at different speeds and to compare it with a traditional training shoe to examine its claimed benefits. An understanding of the biomechanics of the Meridian Elyte shoe would be valuable in terms of promotion of the benefits of the shoe and to provide a basis for design modifications to enhance the effect or manipulate it to provide application to other populations and uses.

Methods: The proposed study will be a cross-sectional analysis of Meridian Elyte shoe in comparison with a traditional training shoe. The kinematic & kinetic variables and the muscular activities during walking and running will be collected and recorded. A total of 20 healthy collegiate students (10 men and 10 women) without lower-extremity problems will be recruited as subjects. For familiarization, subjects will be asked to finish at least 8 sessions of 30-min walk or run with the Meridian shoes during the 2-week period prior to data collection. In the actual data collection, 17 retroreflective markers will be attached to the body landmarks. EMG electrodes will be placed on the gastrocnemius, tibialis anterior, biceps femoris, and vastus lateralis of the right leg with 2 goniometers fixed on the ankle and the knee. The subjects will be asked to walk or run along a 20-m walkway with an embedded forceplate. Two-dimensional motion analysis based on the 2-D DLT method will be performed to quantify the segment motions and joint ranges of motion. Four video cameras will be used to record the subject's motion: two for the right & left sagittal views of the subject's whole body movement; two for the detailed lateral and rear views of the foot motion. From the kinematic data and the GRF data, the joint torques will be computed through the inverse dynamics approach to assess the load on the muscle groups. The foot-ground interaction patterns will be also examined based on the GRF data. The RMS values of the EMG signals will be computed for different gait phases to assess the muscular activities of the leg muscles.

The order of presentation of the two conditions, Meridian Elyte shoe and the traditional training shoe, will be balanced, matched and randomized to reduce the possible effects of fatigue and learning. A series of T-test will be performed to compare the biomechanical characteristics of the Meridian Elyte with the traditional training shoe at $p < .05$.