THE EFFECT OF FOOTWEAR ON GAIT AND STAIR MECHANICS IN HEALTHY WOMEN

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BACKGROUND AND PURPOSE: Women wear a wide variety of footwear that may change how they ambulate. Our purpose was to investigate how types of footwear (flip flops, flats, tennis shoes, heels and barefoot) affect muscle activation and lower extremity (LE) kinematics while walking on flat ground and while descending stairs.

SUBJECTS: A convenience sample of 11 healthy females (27.1 years, 65.3 inches, 134.3 pounds) participated in the study.

METHODS AND MATERIALS: This study was conducted as an experimental design, using healthy volunteers. Surface electromyography (sEMG) signals were recorded, with electrodes applied to the gluteus medius, rectus femoris (RF), general hamstrings (GH), and general gastrocnemius (GG) muscles. Video cameras were used to measure LE kinematics with Dartfish Software. Data was collected on a level surface and stair descent for each of the five footwear conditions.

ANALYSES: Repeated-measures ANOVAs were used to determine differences across footwear conditions.

RESULTS: Kinematics: Change in hip adduction angles while descending stairs was statistically different in the heel condition versus the flip flop (p=.008) and tennis shoe (p=.017) conditions. Right knee flexion in the heel condition is significantly different than all other footwear conditions at right initial contact (p<.01), mid-stance (p<.01), and left initial contact (p<.01) during the gait cycle. sEMG: There is a significant effect of footwear with the heel condition eliciting significantly higher muscle activation than all other footwear types in all muscles tested (p<.01), except for GH and GG in the barefoot condition. There is a significant effect of surface with descending stairs eliciting a higher RF activation than walking (p<.01).

CONCLUSIONS: Wearing heels requires more muscle activation than the other footwear conditions while walking and while descending stairs. Subjects displayed more knee flexion while wearing heels during the stance phase of gait.

IMPLICATIONS: This study provides the potential for making recommendations to patients on their footwear. Further research is needed on the patient population.