FOOT STRUCTURES INCREASED POSITIVE MECHANICAL WORK DURING LOADED WALKING.

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INTRODUCTION

• Humans must absorb/store and generate/return energy during locomotion.
• Foot deformations are responsible for absorption and dissipation of energy during locomotion [1].
• Purpose: To determine how walking with varying levels of added mass affects the combined functional behavior of the foot?
• Hypothesis: We hypothesized that the foot structures would increase the amount of dissipated/absorbed energy when walking with added mass.

METHODS

High Speed Motion Capture Cameras

• Eighteen healthy, young participants completed barefoot walking over force plates in three randomized loading conditions (0, +15, and +30% of added body mass).
• The walking speed was targeted at 1.25 m/s (2.8 mph).

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RESULTS & CONCLUSIONS

Figure 2: Negative, positive and net work produced by the structures distal to the hindfoot.

• Walking with added mass caused a significant increase in the magnitude of positive work production (20% increase per 30% increase in added mass).
• Walking with added mass had no significant effect on negative (p = 0.055), and on net work (p = 0.402).
• Experimental results failed to support our initial hypothesis, as the foot increased the magnitude of positive work, and preserved similar amounts of net negative work (i.e., energy dissipated/absorbed) across varying levels of added mass conditions.
• Overall, the foot appears to have similar characteristics of a shock absorber-spring complex.

FUTURE APPLICATIONS

• Robotics.
• Prosthetic devices.
• Foot Pathology
• Rehabilitation & assistive devices.
• Shoes.

REFERENCES