

Effects of Height Increasing Heel Insole on Lower Extremity Joint Mechanics

INTRODUCTION

•High-heeled shoes are being worn for fashion and societal purposes. High heeled shoes cause irregular foot pressure distribution and alters lower extremity kinetic and kinematics.

•However, heel insoles (Figure 1) are used for therapeutic purpose.

•Purpose of the study is to compare the ground reaction force, and lower extremity kinetic and kinematics of gait with and without height increasing heel insoles.



Figure 1. Height increasing heel insole (5 cm)

EXPERIMENTAL METHODS

•2 healthy male (mean age: 29, height: 173cm, weight: 73kg, shoe size: 270cm)

•Level walking; 2 trials without insole and 2 trials with height increasing heel insoles. 1 minute of practice walking to be habituated to the heel height before the 4 trials. The kinetic and kinematic data during the stance phase of the right foot was used for data analysis.

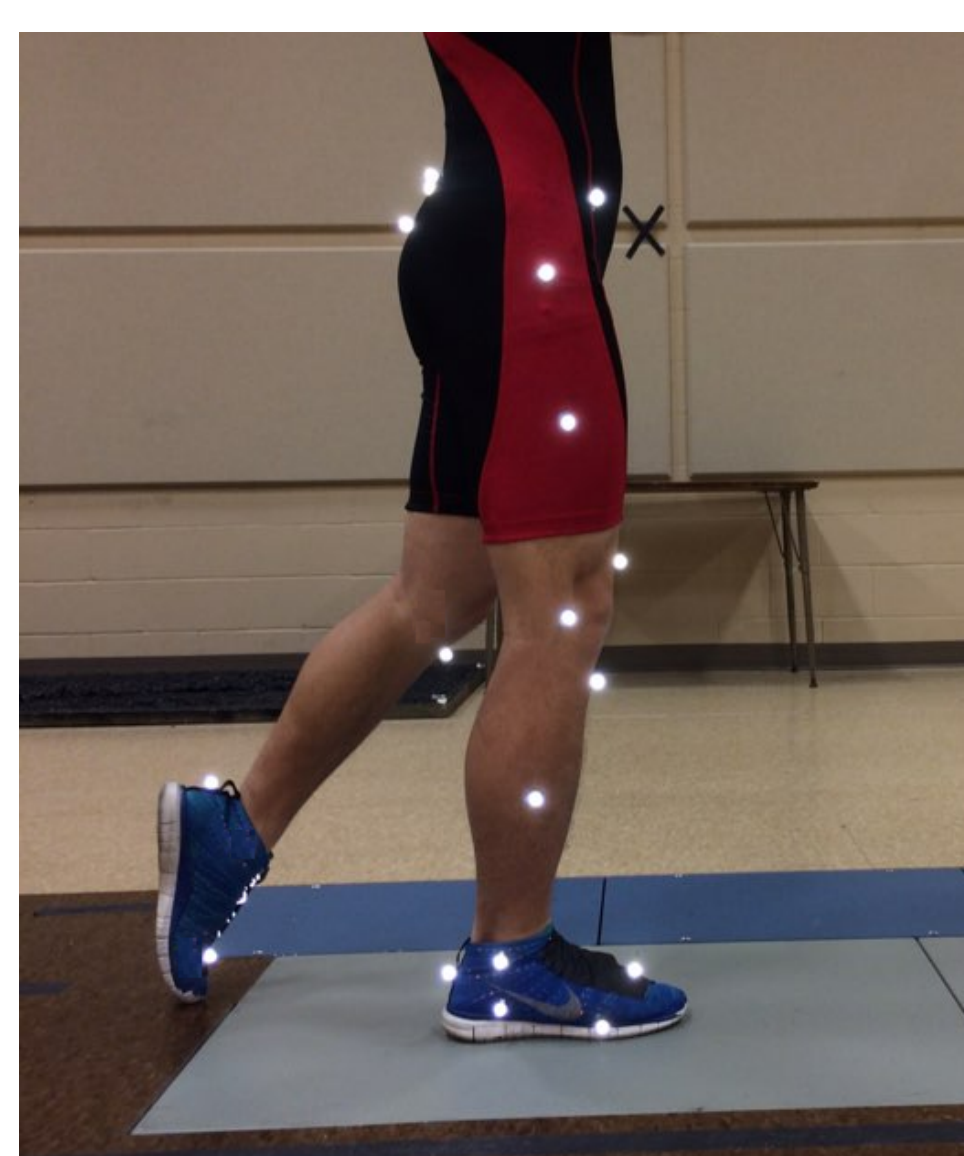


Figure 2. 27 markers were placed on landmarks of the lower extremity and pelvis.

RESULTS

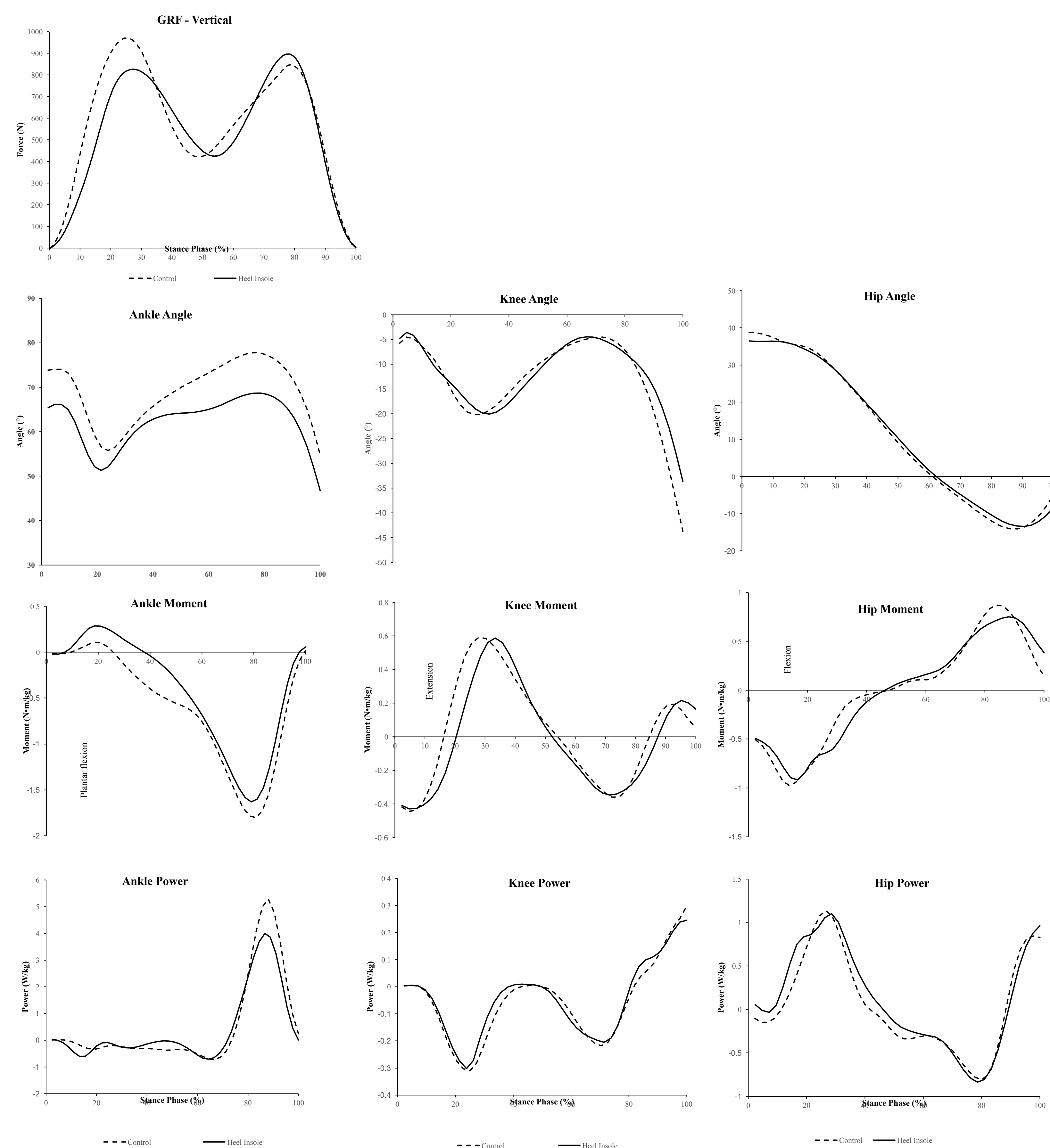


Figure 3. Comparison of GRF, joint angle, moment, and power of the ankle, knee, and hip between walking without insoles (broken line) and walking with height increasing heel insoles (solid line).

- Higher heel height decreased GRF under the heel and increased GRF under the forefoot.
- Ankle angle was maintained more plantarflexed during the stance phase.
- Ankle moment in the sagittal plane was reduced with height increasing heel insoles.
- Peak value of the ankle power in the sagittal plane was reduced with height increasing heel insoles.
- No significant difference in the kinetic and kinematics of knee and hip.

CONCLUSIONS

•More plantarflexed ankle angle shortened gastrocnemius and soleus muscles.

•Limited concentric contraction of the plantar flexor muscles means a loss of work required for propulsion.

•The reduced plantar flexor moment limited the power output.

•Because the insoles were cushioned and the trials were conducted without fatigue, the ankle could compensate the altered mechanics, and similar patterns of the knee and hip kinetic and kinematics were present.

•Future studies need to assess the effects of long-term use of height increasing heel insoles to figure out the lower extremity fatigue rates.

•The alteration of ankle kinetics and kinematics may increase the ankle instability and the risk of lower extremity injuries.

•Proper height of insoles are needed to improve the gait pattern and prevent potential lower extremity injuries.

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