RESEARCH ON THE VERTICAL GROUND REACTION FORCE OF MIDSOLE HARDNESS IN HIGH HEELS

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INTRODUCTION

High heels can make women more attractive with a female gait (Morris, 2013). However, the excessive load during wearing high heels was associated with forefoot pain, hallux valhus deformity, and calluse et al. (Domjanic, 2013). The replace of midsole material may change the plantar pressure of high heels. Ground reaction force (GRF), the peak shoes-ground force, is important in gait analysis (Winter, 1991) and can reflect the plantar pressure. Therefore, the purpose of this study was to compare the vertical GRF of high heels with different midsole materials, and investigate the effect of midsole hardness on the vertical GRF.

METHODS

Three kinds of high-heeled shoes which differes only in midsole hardness of forefoot area were investigated, which named by H (Shore O:22, hard), HS (Shore O:18, hard-soft), and S (Shore O:12, soft) respectively. The vertical GRF was messured by footscan® plate system (Rsscan, Belguim; 1m×0.4m, 250Hz). The footprint were divided into five regions: toe, medial forefoot, lateral forefoot, midfoot, and heel. Only data for right foot was analysed. One-way ANOVAs was used to assess differences in GFR among the three conditions. All ststistical analysis were done by the software SPSS 17.0. (figure1)

Forty women who wearing shoe size Euro 37 participated in this study (aged 25±3 years). All subjects had a normal arch and no history of lower extremity injury or foot pain. Informed consent was signed by all of them prior to testing.

Figure 1. tested shoe and the ground reaction force

RESULTS

Comparison of GRF was shown in Figure 2. The toe region displayed statistically significant decrease in GRF in the HS condition (0.040) and S condition (0.006) compared to the H condition. The GRF was higher during the H midsole condition compared to both the HS and S midsole conditions in forefoot area (both medial and lateral forefoot), but no statistically significant difference was found. The GRF value of midfoot area was zero in all conditions, because there was no contact with the ground in this area. However, the GRF was lower during the H condition compared to the HS condition in heel region, but still higher than the S condition.

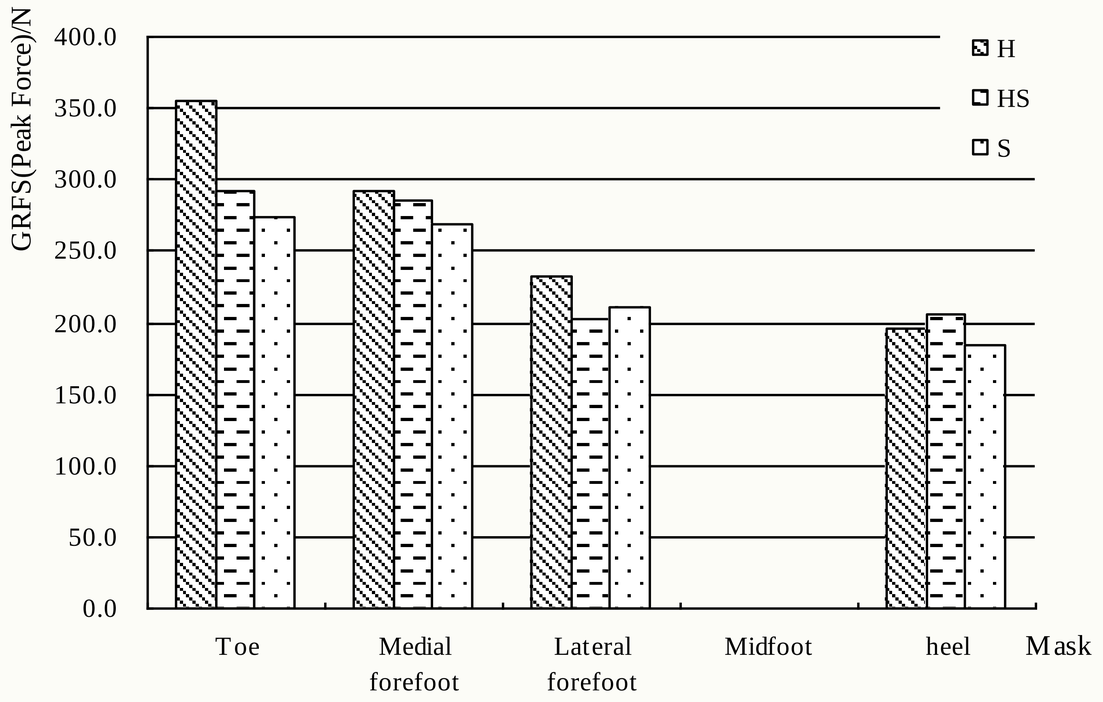

Figure 2. Comparison of the vertical GRF on shoes-ground interface

DISCUSSION AND CONCLUSIONS

The vertical GRF of H condition was higher in toe and forefoot regions, but lower in heel, which was contrary to HS condition，which suggests that softer midsole may relieve the excessive vertical GRF of the forefoot which caused by heel height. However, the range of midsole hardness was not enough in this study, furture research could expand the hardness range.

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