

How the indoor slippers affect our feet?

Open-toe mule slippers are popular footwear worn at home especially by older women. They are light in weight and convenient to wear. Nevertheless improper footwear and/or slippers may lead to foot pain and deformity, and even increase the risk of falls and injuries in older people. But, up to now, their effect on human feet is still poorly understood. This study is therefore conducted to evaluate the physical properties of two typical types of open-toe mule slippers and the changes in plantar pressure and lower limb muscle activity of older women when wearing mule slippers.

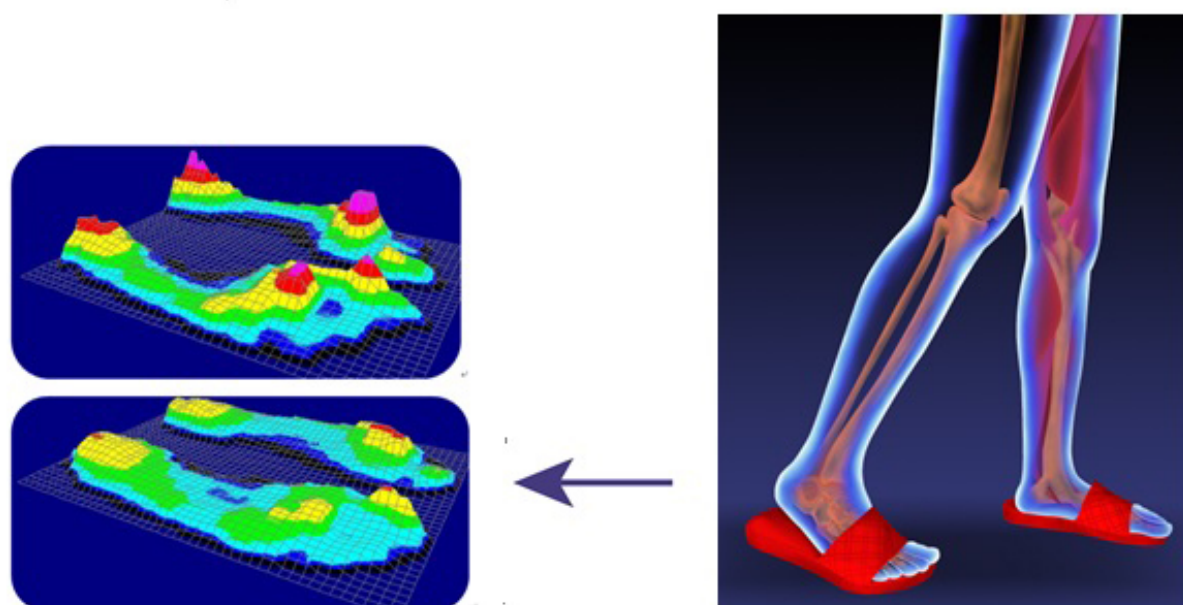


Fig. 1. Plantar pressure distribution in barefoot and slippers during walking.

The design of experiment: Five walking trials have been carried out by ten healthy older women between 60 and 67 years of age (mean: 62.85; SD: 2.81). Their feet are all in good conditions and no major foot deformity or pain during the study. Three experimental conditions were used, including barefoot and the donning of two types of slippers: Soft and Hard slippers. The selected slippers are those that are commonly worn by local older women at home. Both types of slippers are open-toe and secured to the feet with a strap across the dorsal forefoot.

Analysis of the result: Compared to barefoot, wearing slippers results can increase foot contact area at foot landing. Walking with slippers can lead to pressure redistribution over the plantar of the foot, especially from metatarsal heads 2-3 and the lateral heel to the midfoot regions. The slip-on design of both types of slippers increases pressure at the toes by around two-folds as compared to

the barefoot condition. Similar to the thong style flip flops, the dorsal strap across the forefoot fails to secure the slippers to the feet due to lack of fixation at the heel counter so that the wearers tend to claw their toes for grip during walking. Between the two types of slippers, the Hard Slipper creates higher pressure at the lesser toe regions in comparison to the Soft Slipper. Since the former (212.4 g) is substantially heavier than the latter (61.6 g), the wearers might have increased the gripping of their lesser toes to sustain the slippers onto their feet. The effect of slippers conditions on the selected muscle activity is inconclusive. However, the attempt of the wearers in this study to grip the slippers by using the toe muscles and prevent slip-off due to the absence of a heel counter during the heel strike resulted in higher muscle activity of the anterior lower leg. Besides, older women in the study prefer soft and light over hard and heavy materials in general. Also, they prefer comfortable footwear that does not easily slip off and allows them to walk with ease.

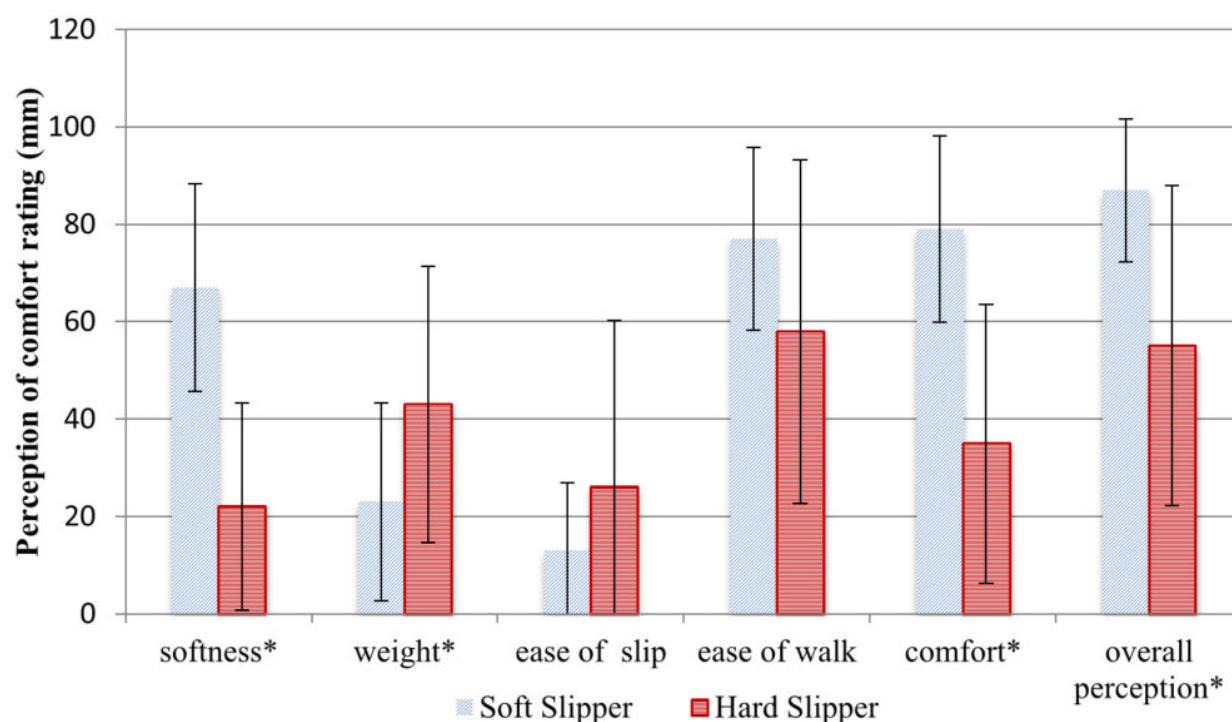


Fig. 2. VAS ratings on perceived comfort between the soft and hard slippers based on different factors (*significant at p less than 0.05), where 0 mm is negative performance and 100 mm is positive performance.

Contribution of the findings: Studies on footwear for the elderly have indicated the importance of appropriate footwear for enhancing foot protection in which rigid soles are suggested to improve postural stability. However, slippers worn by older people that are inadequately designed with excessively soft soles, lack of fixation and flexible heel counter not only fail to control heel motions,

but also increase muscle efforts and impair stability. The findings from this study can therefore enhance our understanding of slipper features that are associated with changes in plantar pressure and muscle activity in older women, and provide the basis for indoor slipper designs which would allow for better foot protection and comfort, and reduce tissue injury and muscle activity in older people.

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