

C-H. HUANG, C. PEI, C-Y. GU, W-M. CHI, W-T. CHANG. *Effect of the medial longitudinal arch height on plantar biomechanics: A dynamic comparison. Gerontechnology 2010;9(2):292; doi:10.4017/gt.2010.09.02.157.00.*

**Purpose** The plantar pressure distribution (P) and the plantar-ground contact time (T) are two important dynamic biomechanics parameters in human walking. The variation of the parameters is highly related with foot types. Previous research focused on the correlation analysis between medial plantar longitudinal arch height, and P<sup>1</sup>. The loading and distribution of plantar pressure were also affected by the age<sup>2</sup>, gender, body fat<sup>3</sup> and external-forces<sup>4</sup>. However, the analysis of the correlation between the plantar medial longitudinal arch height and the dynamic foot functions is very few. The purpose of this study was to determine correlation between the medial longitudinal arch height and the foot dynamic functions. **Method** The heat moldable orthotic can provide an arch support to different foot types (neutral, high arch, and flat) by an adjustable characteristic of arch curve after heated. All subjects were measured and analyzed the dynamic parameters, P and T, at the heat orthotic, regular insole, and barefoot three different walking feet conditions to verify the impaction on various plantar areas. A total of 35 female subjects (caregivers; 61±9 Kg) were recruited. The foot types screening was done by the foot type test<sup>5</sup>. Twenty-four abnormal feet were found: 4 right high arch, left neutral; 5 right neutral, left flat; 2 both flat feet; 1 both high arch feet. The RScan footscan<sup>R</sup> pressure measurement system was used to collect the dynamic data. Participants were asked to complete three acceptable trials in each of three types of the walking feet conditions. **Results & Discussion** A significant pressure difference was observed for flat foot in the Heel Lateral (bare foot : 7.88N/cm<sup>2</sup>; the heat orthotic: 6.29N/cm<sup>2</sup>) and Toe1 (the first toe area) (bare foot: 5.10N/cm<sup>2</sup>; the heat orthotic: 2.67N/cm<sup>2</sup>) (Figure 1). No significant effect or interaction was evident in plantar-ground contact time of neutral and high arch feet compared with barefoot. However, the significant differences occurred in the Heel Lateral (barefoot:440ms; the heat orthotic:345ms) and the Toe1 (barefoot:561ms; the heat orthotic:450ms) of the flat foot with the heat orthotic (Figure 2). During each trial, the cadence and the stride length were fixed. The plantar-ground contact time decreasing results in the swing phase time increasing, the double support phase time decreasing as well as walking speed increasing in the gait cycle<sup>6</sup>. It is due to an appropriate arch support for a flat foot that it is able to transfer the body weight into an upward reaction force, and this force decreases the plantar-ground contact time and the plantar pressure. These results indicate the importance of an appropriate arch height for those who need long term standing and walking at work, such as caregivers, in order to decrease fatigue and remain working efficiently.

## References

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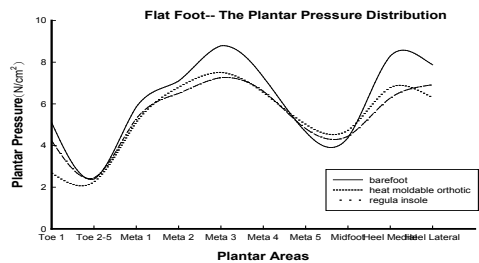


Figure 1. Flat foot : The plantar pressure with different walking feet conditions in plantar areas

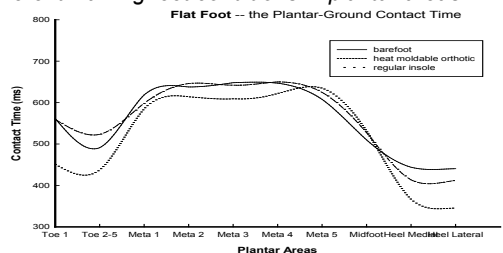


Figure 2. Flat foot : The plantar-ground contact time with different walking feet conditions in plantar areas