Foot deformations under different load-bearing conditions and their relationships to stature and body weight

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Footwear comfort is primarily determined by the fit between the foot and the shoe. Foot deformations that cannot be accommodated by the flexibility of the material of the shoe upper have to be dealt with by other adaptive means. The major purpose of this study was to determine foot deformations using nine foot dimensions—foot length, arch length, foot width, midfoot width, heel width, midfoot height, medial malleolus height of the most protruding point, lateral malleolus height of the most protruding point and ball girth—as well as the eversion/inversion of the foot while bearing weight. Each foot of 30 Hong Kong Chinese adults (15 males and 15 females) was laser scanned under the conditions of no body-weight (NWB), half body-weight (HWB) and full body-weight (FWB). The nine dimensions and foot rotation were determined with a computer program. The results show that the foot became significantly longer, wider, and reduced in height while everting with increased loading on the foot. The midfoot had relatively large changes in width and height when compared to the forefoot and rearfoot. Even though there were no obvious patterns between the left and right foot for both males and females, considerable differences did exist between the two feet of a few participants. Foot length as a percentage of stature...
changed from 14.94% to 15.10% to 15.13% in males as the load on the foot increased from NWB to HWB to FWB, respectively. These percentages were 14.56%, 14.72%, and 14.77% for females. Even though foot width was significantly correlated with the body weight of males, no such relationship exists in Hong Kong females.
The BMI of participants was in the normal range between 18.50 and 24.99 kg/m² [51], seen in Table 1. As the BMI of all participants were in the normal range, the foot shape changes for different body weight or load-bearing conditions and different stature can be disregarded under the condition of bearing their own body weight. The explanation for the difference of foot length and width between female participants in this study may be that shod females are more vulnerable to foot deformations, like hallux valgus, owing to wearing high-heeled shoes or sharp-headed shoes [24,48,57]. Long-term wearing of ill-fitted shoes restricted natural foot growth and
movement under weight-bearing-conditions [48]. Foot deformations under different load-bearing conditions and their relationships to stature and body weight. Article. This article presents the methodology of the survey and foot measurements, along with the found data and their significance regarding the traditional processes of search of "proper" shoe fit and the obvious need for higher levels of professional shoe-fitting skills and service. The article also analyzes and discusses some little known or seldom considered complexities of shoe fit and the foot-shoe relationship that surfaces from this study, for example, the role of shoe design, shoe-sizing systems, consumer shoe-buying attitudes, and shoe materials, the four variable phases of shoe f S. Xiong, R. S. Goonetilleke, J. Zhao, W. Li, and C. P. Witana, “Foot deformations under different load-bearing conditions and their relationships to stature and body weight,” Journal of Archaeological Science, vol. 117, no. 2, pp. 77–88, 2009. View at: Publisher Site | Google Scholar. X. P. Chen, “Evolution of the biological basis model in sports training-from super-compensation to adaptation theory,” China Sports Science, vol. 37, pp. 3–13, 2017.