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Biomechanical analysis of different foot morphology during standing on a dynamic support surface

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Abstract: From the research of habitually barefoot people and habitually shod people, there were significant differences in distance between the hallux and the interphalangeal joint of the second toe. Habitually shod males had a high risk of injury because of the lack of toes function. Based on these differences, expanding the distance between the hallux and other toes could increase the ability of hallux, especially the balance. In order to analyse the influence of hallux during balance, three conditions were set with light silica instruments: 1) normal toes, 2) expanding toes, 3) binding toes. A total of 20 young healthy males participated in this study. The six degrees of freedom (6-DOF) transportation vibration platform was used to be undergoing continuous sinusoidal translation. The amplitude of the platform used a sine wave with frequency of amplitude 3 and 1 rad/s ($y = 3\sin 2\pi x$). The PEDAR insole system was used to measure the trajectory of the centre of pressure (COP) and plantar pressure distribution. The plantar surface of the foot was divided into eight areas based on the anatomy of the foot. From the results, Binding Toes showed large postural sway in not only COP, but also forefoot. It indicated that control the toes function would cause instability. Conversely, Expending Toes has less postural sway and instability than normal toes and binding toes. It suggested that the balance ability would increase with the increasing of toes function.

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