

TITLE

The impact of body fat on three dimensional motion of the paediatric foot during walking

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Abstract

Childhood obesity is commonly associated with a pes planus foot type and altered lower limb joint function during walking. However, limited information has been reported on dynamic intersegment foot motion with the level of obesity in children. The aim of this study was to explore the relationships between intersegment foot motion during gait and body fat in boys age 7 to 11 years.

Fat mass was measured in fifty-five boys using air displacement plethysmography. Three-dimensional gait analysis was conducted on the right foot of each participant using the 3DFoot model to capture angular motion of the shank, calcaneus, midfoot and metatarsals. Two multivariate statistical techniques were employed; principle component analysis reduced the multidimensional nature of gait analysis, and multiple linear regression analysis accounted for potential confounding factors.

Higher fat mass predicted greater plantarflexion of the calcaneus during the first half and end of stance phase and at the end of swing phase. Greater abduction of the calcaneus throughout stance and swing was predicted by greater fat mass. At the midfoot, higher fat mass predicted greater dorsiflexion and eversion throughout the gait cycle.

The findings present novel information on the relationships between intersegment angular motion of the foot and body fat in young boys. The data indicates a more pronated foot type in boys with greater body fat. These findings have clinical implications for pes planus and a predisposition for pain and discomfort during weight bearing activities potentially reducing motivation in obese children to be physically active.

Key Words

Pediatric obesity, gait analysis, foot kinematics, 3D motion capture, multivariate analysis