

Abstract:

During human walk, we balance internal muscle forces and external forces outside of the body, while trying to minimize physiological energetic expenditure and mechanical loading on the body. The biomechanics of walking can be affected by various factors, including body size. In individuals with greater body size, the ground reaction force increases, so it is expected that joint moment of the lower limb in individuals with greater body size should increase. However, this relationship is not always true – as documented by previous studies, larger individuals use moderating mechanisms in the form of postural adjustment of the lower limb which decreases the load on joints during walking. The aim of this diploma thesis is to investigate the effect of body size and posture on the biomechanics of walking in the stance phase of walking, and to verify the presence of moderating mechanisms. We obtained kinematic and kinetic data from nineteen probands. The data was collected during three types of walking – during normal walking, walking with extended knees and crouched walking. We used Visual3D software to calculate angles in joints and joint moments of the lower limb. The independent effect of body mass, lower limb length measured in Visual3D, lower limb length measured anthropometrically, biiliac breadth and velocity were all tested using multiple linear regression. Using ANOVA analysis, we verified the differences between the maximum and minimum value of angles and joint moments in the joints of the lower limb in each type of walking. Body size proved to affect the angles and joint moments in the joints of the lower limb. With greater body mass, there was an increase in the hip angle, the ankle moment, knee moment and hip moment in the early phase of the stance phase; and a decrease in the hip moments in the late stance phase. We detected limb length-related decrease of the knee angle and hip angle, knee moment and increase of the ankle moment. Greater body size does not necessarily increase the joint moments in joints of the lower limb. Individuals with greater body size moderate joint moments in the joints during walking by changing the posture of the knee and hip in the late stance phase of walking.

Key words: body size, stance phase, joint moments, angle in joints, moderating mechanism

