This study was to investigate the effects of rocker heel angle during walking on gait mechanics and muscle activity of lower extremity. While fifteen healthy men walked with two pairs of different rocker heel shoes (15° and 20°) and a pair of normal running shoes at 1.33m/s on the treadmill, the joint kinematics and EMG signal were simultaneously recorded for 1 minute. Temporal variables of gait pattern and ankle, knee, hip and trunk angle were analyzed using 3D motion analysis at 100Hz. Muscle activity of rectus femoris, tibialis anterior, biceps femoris and medial gastrocnemius were analyzed at 1000 Hz. To compare statistical difference of each shoes, the one-way ANOVA with repeated measures was conducted. The swing phase time was significantly increased in the 15° rocker heel shoes than 20° rocker heel shoes (p<.05) while any significant changes were not observed in stride and stance phase time. The hip joint tend to more extend at midstance with the 15° rocker heel shoes compared to two other pair of shoes. The knee extension was increased more significantly in the 15° rocker heel shoes than the 20° rocker heel shoes at right toe-off. Ankle dorsiflexion was clearly decreased in the 15° rocker heel shoes at left heel strike and in the 20° rocker heel shoes at right toe-off (p<.05). Ankle maximum angle and range of motion (ROM) were also significantly decreased in the 20° rocker heel shoes than the normal control shoes (p<.05). Muscle activity of the tibialis anterior was significantly increased in the both rocker shoes than the normal shoes during a cycle stride (p<.05). And the medial gastrocnemius increased muscle activity in the 20° rocker heel shoes than the normal shoes (p<.05). But no significant differences in IEMG were observed among the shoes during the stance phase. In swing phase, muscle activity of rectus femoris was increased in the 15° rocker heel shoes about 9% and biceps femoris was increased in the 20° rocker heel shoes about 17% (p<.05). The maximum peak time of tibialis anterior showed the delay of approximately 23.8% time in the 15° rocker heel shoes than normal shoes (p<.05). The gait pattern was different coordination movement between trunk and lower limb joint in two kinds of rocker shoes on the treadmill. Both rocker heel shoes decreased in trunk movement compared to the normal shoes and observed that anterior trunk tilt suddenly happen being extension of hip joint motion. In case 20° rocker heel shoes during terminal stance, trunk was rapidly conducted into posterior tilt. The 15° rocker heel shoes reduced hip and knee joint range of motion and increased ankle range of motion. It was shown a pattern of knee flexion maintaining ankle dorsiflexion. Also Knee joint was suddenly changed between flexion and extension in the 20° rocker heel shoes during initial stance. The overall variability of the 15° rocker heel shoes was increased in the first half of the stance phase and the variability of the 20° rocker heel shoes was increased in the terminal stance phase. The coordination was decreased in the joints of the lower limb. It is concluded that that with rocking movement at knee and ankle joint, muscle activity of the gastrocnemius and tibialis muscles increased and the co-contraction of these muscles could provide for stability.

Keywords: Foot, Balance, Biomechanics