Isokinetic dynamometry offers a safe and effective way to induce fatigue in isolated muscle groups, however protocols involving the ankle and especially eccentric muscle actions, are scarce. **Objective:** The purpose of this study was to examine neuromuscular function [strength and electromyography (EMG)] in healthy, uninjured ankles both pre and post fatigue. **Design and Setting:** All testing was completed using an isokinetic dynamometer and involving the subject’s dominant leg. Baseline isokinetic strength measurements were taken for the motions of plantar flexion/dorsiflexion and inversion/eversion at a velocity of 120°/s on two separate sessions in random order. Using a 50% decrement of baseline strength as a reference, fatigue was induced in each of these four motions individually. Post-fatigue isokinetic strength measurements were taken immediately after the fatigue event in a manner similar to that of the baseline test. **Subjects:** A total of 9 male (age: 20.1 ± 1.5 yrs; height: 1.81 ± 0.09 m; mass: 84.4 ± 14.2 kg) and 10 female (age: 20.5 ± 2.0 y; height: 1.66 ± 0.05 m; mass: 62.9 ± 3.7 kg) subjects were recruited from the university community. All subjects were free from any lower extremity injury at the time of the study. **Measurements:** EMG was taken from the tibialis anterior (TA), peroneals (PER), and gastrocnemius (GAS) muscles. Torque (force) and peak EMG activity (activation) were calculated. Separate repeated-measures MANOVAs were performed for each of the four ankle motions (P < .05). **Results:** Torque, for all four motions, was greater in males vs. females, in eccentric vs. concentric muscle actions, and in the pre vs. post fatigue (P<0.05). A time x gender interaction was detected (P=0.024) for inversion, for both torque (P=0.008) and TA activation (P=0.024). For plantar flexion, a time x gender interaction (P=0.005) for torque (P=0.020) and TA activation (P=0.007) and a time x type interaction (P=0.009) for torque (P=0.002) were detected. **Conclusions:** In general, females displayed a greater activation than males and muscle activation decreased in all muscles after fatigue. This was true for all four motions, although it was not significant in all cases. Overall, when compared to females, males had a lower activation, but a higher torque, and in both cases (activation and torque) males decreased more than females after fatigue, which suggests differences in neural control in males vs. females. The males were more efficient in neural control, in that they activated a lesser percentage of muscle, yet produced greater torque. **Key Words:** isokinetic fatigue, electromyography, lower extremity.