

Lower Extremity Muscle Activity When Walking on a Non-Motorized Treadmill

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ABSTRACT

Effective interventions for increasing walking speed are important for improving health and quality of life in aging populations. Non-motorized treadmills (NMT) may enhance the ability to develop or improve motor control in gait by requiring the participant to produce and maintain speed as compared to use of a motorized treadmill (MT) which requires one to simply match speed. **PURPOSE:** The purpose of this project was to compare muscle activation patterns of lower extremity muscles between MT, NMT and overground (OG) walking. **METHODS:** Twenty healthy adults (24.4±7.2 yrs, 1.75±0.09 m, 75.4±13.1 kg) completed one trial of walking at each of three speeds (2.5, 3.5, 4.5 mph) and three modes (OG, MT, NMT). Surface EMG of the Biceps Femoris (BF), Tibialis Anterior (TA), Gastrocnemius (GA), and Vastus Medialis (VM) was collected at 1000 Hz using electrodes placed longitudinally at the midpoint of the muscle belly. After removing DC bias, EMG RMS was computed using a moving window of 250 ms. Peak EMG RMS within a stride was averaged across 8 consecutive gait cycles identified using vertical acceleration measured with a triaxial accelerometer. Separate 3x3 repeated measures ANOVA's were used to compare muscle activity across walking speed and mode for each muscle. **RESULTS:** For all muscles, there was no significant interaction between walking mode and speed. Muscle activity significantly increased with walking speed ($p < 0.05$). TA, VM, and GA activity was not different between walking modes ($p < 0.05$). At 2.5 mph, GA muscle activity, was significantly ($p < 0.001$) higher for NMT (0.44±0.16 mV) than MT (0.33±0.13 mV) and OG (0.31±0.14 mV) but MT and OG were not different. At 3.5 mph, GA muscle activity, was significantly ($p < 0.001$) higher for NMT (0.49±0.19 mV) than MT (0.36±0.15 mV) and OG (0.36±0.17 mV) but MT and OG were not different. At 4.5 mph, GA muscle activity, was significantly ($p < 0.001$) higher for NMT (0.58±0.28 mV) than MT (0.47±0.19 mV) and OG (0.44±0.19 mV) but MT and OG were not different. **CONCLUSIONS:** These data suggest that use of NMT accentuates plantar flexor activity when walking. Given that reduced plantar flexor activity contributes to reduced gait speed in older adults, use of NMT has potential for clinical use in treatment of gait deficiencies in aging adults.