

Comparison of Overground, Motorized Treadmill and Non-Motorized Treadmill Gait

KEVAN D. KENNEDY, EMMA C. WILLIAMS, AND SCOTT P. MCLEAN

Human Performance Laboratory; Department of Kinesiology; Southwestern University; Georgetown, TX

Category: Undergraduate

Advisor / Mentor: McLean, Scott (mcleans@southwestern.edu)

ABSTRACT

Shaulis et al., (2022) found that walking on a non-motorized treadmill (NMT) elicited greater EMG activity from plantar flexor (PF) muscles compared to walking overground (OG) and on a motorized treadmill (MT). **PURPOSE:** To compare kinematics, kinetics and EMG in OG, MT, and NMT walking. **METHODS:** Twenty-one healthy adults (24.4 ± 7.2 yrs, 1.75 ± 0.09 m, 75.4 ± 13.1 kg) completed one trial of walking at 3.0 mph in each of three modes (OG, MT, NMT). All dependent measures were averaged across a minimum of two consecutive gait cycles. Surface EMG of the Gastrocnemius (GA), and Tibialis Anterior (TA) was collected at 1000 Hz from which peak EMG RMS was measured. Lower extremity kinematics were recorded at 100 Hz from which PF ROM was measured. Force normal to the plantar surface of the foot was measured at 200 Hz from which peak force (PkF), maximum loading rate (LR), and contact time (CT) and step rate (SR) were measured. Separate one-way repeated measures ANOVA's were used to compare dependent measures across gait mode. **RESULTS:** GA muscle activity was greater ($p < 0.05$) in NMT (0.17 ± 0.11 mV) than MT (0.11 ± 0.08 mV) or OG (0.12 ± 0.08 mV). No differences in TA activity or PF ROM between modes was observed. No difference in the amount of plantar flexion was observed between modes. SR was higher ($p < 0.05$) on MT (94.3 ± 5.6 steps/min) and NMT (101.9 ± 7.8 steps/min) than OG (90.0 ± 6.1 steps/min). Similarly, CT was significantly lower ($p < 0.05$) on MT (644 ± 35 ms) and NMT (681 ± 35 ms) than OG (705 ± 46 ms). PkF was lower ($p < 0.05$) on the NMT (1.20 ± 0.06 N) than either MT (1.23 ± 0.06 N) or OG (1.25 ± 0.06 N). LR was higher on MT (11.4 ± 2.1 N/s, $p < 0.05$) and NMT (11.2 ± 2.2 N/s, $p = 0.06$) than OG. **CONCLUSION:** Use of NMT accentuates plantar flexor activity when walking with no observed kinematic changes in ankle movement while reduced CT and increased SR resulted in a higher LR but lower PkF. These data suggest that use of a NMT may provide a viable means to elicit enhanced neuromuscular activity with minimal changes to the gait pattern which may offer an intervention to slow or minimize age-related declines in gait.