ALL BODY WEIGHT SUPPORTED TREADMILLS ARE NOT ALIKE: DIFFERENCES IN HIP AND KNEE KINEMATICS.

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Introduction: Body weight supported treadmill training is used for rehabilitation of numerous neurological and musculoskeletal conditions. However, it is unknown if different commercially available unweighting systems produce similar kinematic results in the lower extremities. **Purpose:** The purpose of this investigation was to compare hip and knee ranges of motion (ROM) and angular velocities when using an overhead harness/treadmill (Biodex NxStep Unweighting System) system versus an anti-gravity treadmill (AlterG Anti-Gravity Treadmill™) system at 0%, 40%, and 60% unweighting during ambulation. **Subjects:** A total of 17 subjects (9 males, 8 females) participated in the study. **Methods:** A convenience sample of seventeen subjects was recruited from Hardin-Simmons University. Following informed consent, subjects were measured for height and weight and the equipment was calibrated to the subject's measurements. The myoMotion Research Pro System (Noraxon USA) with inertial measurement units (IMU) were used to capture hip and knee joint angles and linear accelerations. IMUs were placed on the bilateral anterior thighs, shanks, and L4-5 spinal region and calibrated prior to each trial. Subjects were given a brief trial to acclimate to the equipment. Following acclimation, subjects walked at 3-mph for 3-minutes per trial on each treadmill at each level of body weight assistance (0%, 40%, 60%) for a total of six trials. The order of the treadmill and unweighting conditions were randomized for each subject. One-minute rest intervals occurred between each walking trial on a given treadmill. Upon completion of all trials on one treadmill, subjects rested X minutes while being equipped for the second treadmill. The subjects then completed the remaining trials on the second treadmill. Two-way repeated measures ANOVAs were used to test for interaction effects between the treadmill types and unweighting conditions. One-way repeated measures ANOVAs were used to determine the main effects of the weighting conditions and treadmill type. Statistical significance was set at $p \leq 0.05$. **Results:** The subjects' mean weight, height, and age were 170.71 ± 31.97 lbs; 69.97 ± 2.66 inches and 21.98 ± 1.38 years respectively. The AlterG Anti-Gravity Treadmill™ allowed for significantly greater hip flexion ROM and hip flexion angular velocity than the Biodex NxStep Unweighting System at 40% and 60% unweighting. At 0%, 40% and 60% unweighting, the treadmills differed in two, five and six of eight dependent variables. It can be concluded that while both treadmills unweighted the subjects, they affected hip and knee ROM and angular velocities differently. **Conclusions:** The two bodyweight supported treadmills in this study produced significantly different lower extremity kinematics in young, healthy adults during ambulation. These differences increased as the amount of unweighting was increased. **Clinical Relevance:** Clinicians may need to consider the variation in lower extremity kinematics produced by the specific unweighting systems in order to choose the most appropriate equipment for a given individual or patient population. These findings need to be verified in a symptomatic population to establish their generalizability.