biomechanical factors associated with the development of hip OA. **PURPOSE**: To assess hip biomechanics during gait in normal weight and obese adults to explore the effect of a sedentary lifestyle on the progression of hip OA. **METHODS**: Gait analyses were performed on 18 sedentary young adults. Participants were separated into two groups based on body mass index. Group 1 consisted of sedentary normal weight adults (n=9) and group 2 consisted of sedentary obese adults (n=9). Three-dimensional kinematic and kinetic data were collected at 200 Hz and 1000 Hz respectively as participants walked 12 meters at their preferred velocity. Hip joint angles and moments were calculated. Average range of motion and peak moments were determined and assessed for statistically significant differences between groups using independent t-tests with the alpha level set at 0.05. **RESULTS**: The two groups walked at similar preferred velocities (3.15 ± .30 m/s;3.16 ± .25 m/s; p = 0.96). Range of motion in the sagittal (40.31 ± 4.68°; 41.11 ± 6.05°; p = 0.48) and transverse planes (13.48 ± 3.29°; 13.27 ± 4.15°; p = 0.78) were similar between groups. Coronal plane range of motion was significantly greater in group 1 than group 2 (13.94 ± 2.68°; 12.63 ± 2.60°; p = 0.02). Average peak hip extension moments were also similar between groups (50.60 ± 13.72 Nm/kg; 51.44 ± 14.63 Nm/kg; p = 0.78). **CONCLUSIONS**: Sedentary normal weight and sedentary obese individuals had similar sagittal range of motion and peak extension moment at the hip. The literature shows that individuals with hip OA experience limited sagittal range of motion and reduced extension moment. Taken together, current results suggest that sedentary behavior, regardless of body weight, may contribute to the development of hip OA.

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Gait Mechanics between a Lower Body Positive Pressure and Regular Treadmill

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Lower Body Positive Pressure Treadmills (LBPPT) allow for unweighted running and are often used as a tool for gait re-training or running load management. To our knowledge no study has examined differences in gait mechanics during walking and running between LBPPT 100% WB and a regular treadmill (TM).**PURPOSE**: The purpose of this study is to examine differences in cadence, stance time, maximal heel strike force (HS), and maximal metatarsal force (MT) between a LBPPT at 100% BW and a regular treadmill as measured through a in-shoe pressure sensor system (PSS). **METHODS**: 7 participants (mean age: 31.14 ± 6.03, mean weight: 83.89 ± 10.61) donned the PSS and were set-up in the LBPPT. The subjects performed a running protocol which had stages from 3 mph to 6 mph at 1 mph increments at 100% BW. Following the running protocol on the LBPPT the participants completed the same running protocol on the TM. Cadence, average stance time between both legs, HS, and MT were recorded with the PSS at each stage of the test with each stage lasting 15 seconds. **RESULTS**: A 2x4 repeated measure ANOVA and Intra-class correlations were run to examine the data for any significant differences and level of agreement. For cadence, there was no significant main effect of device (F(1,5) = 5.68, p =.06) and both devices showed a good level of agreement (ICC = .83). For stance time, there was a significant main effect of device (F(1,5) = 8.69, p = .03), a significant main effect of speed (F(3,15) = 39.59, p≤.0005), and both devices showed an excellent level of agreement (ICC = .93). For HS, there was a significant interaction of device and speed (F(3,15) = 3.58, p = .04) with post-hoc comparisons with Bonferroni adjustment showing a difference between 3 and 4 mph on the TM (mean difference = 24.33, p = .04). HS showed an excellent level of agreement between devices (ICC = .93). For MT, there was a significant effect of speed (F(3,15) = 5.67, p = .01) but no significant effect of device (F(1,5) = .31, p = .60). MT showed a good level of agreement between devices (ICC = .89).
CONCLUSIONS: Our results show that while there was a significant difference between LBPPT and TM for ST, the overall level of agreement and lack of difference between devices for cadence, MT and HS show that the LBPPT can be used at 100% BW with little deviation in gait mechanics compared to a TM.

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Validation of a Built-In Gait Analytics System for Lower Body Positive Pressure Treadmills

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Lower Body Positive Pressure Treadmills (LBPPT) allow for unweighted running, giving the user the choice to adjust their bodyweight from 100% to 20%. Some LBPPT's have added the option for a built-in gait analytics system (GAS) which provide real-time gait analysis data including weight bearing symmetry, step length, stance time, and cadence.
PURPOSE: To validate the LBPPT GAS compared to an in-shoe pressure sensor system (PSS).
METHODS: 8 subjects (mean age: 30.80 ± 6.98, mean weight: 69 .54 ± 15.53) donned the PSS and were set-up in the LBPPT. The subjects performed a running protocol which had stages from 3 mph to 6 mph at 1 mph increments from 80% bodyweight to 20% body weight (20% increments) at each speed setting. Weight bearing symmetry, stance time, and cadence were recorded with the PSS and GAS at each stage of the test with each stage lasting 15 seconds.
RESULTS: Pearson correlations and Intra-class correlations were used on weight bearing symmetry, stance time on both the left and right leg, and cadence acquired from the GAS and PSS. Weight bearing symmetry was not correlated between devices, r = -.06, p = .53, r^2 = .01, ICC = -.13. Right stance time was found to have a small significant correlation, r = .37, p ≤ .001, r^2 = .14, ICC = .40. Left stance time was found to have a small to moderate significant correlation, r = .43, p ≤ .001, r^2 = .19, ICC = .37. Cadence was found to have a small significant correlation, r = .37, p ≤ .001, r^2 = .14, ICC = .18.
CONCLUSIONS: These findings are unable to support the LBPPT GAS as a valid gait analysis tool related to weight bearing symmetry, stance time and cadence due to relatively poor agreement and correlations when compared to direct measures from a in-shoe pressure sensor system.

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Effects Of Arm Weight On Gait Performance In Hemiparetic Stroke And Healthy Subjects

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PURPOSE: The purpose was to investigate the effects of arm weights on arm swing amplitude, gait performance, and muscle activity in stroke patients and healthy subjects.
METHODS: Nine hemiparetic stroke and nine healthy subjects participated. Subjects walked at their preferred speed under different weight carriage conditions (stroke/healthy group; C1: no weight; C2: uninvolved/dominant arm weight; C3: involved/non-dominant arm weight; C4: bilateral arm weights).
RESULTS: In stroke patients, gait speed (P = 0.048, C1: 0.639 ± 0.259 (M ± SD); C2: 0.662 ± 0.259; C3: 0.700 ± 0.246; C4: 0.689 ± 0.267 m/s) and involved side tibialis anterior integrated EMG (iEMG) values (P = 0.018, C1: 49.588 ± 13.300; C2: 44.998 ± 12.713; C3: 43.291 ± 13.961; C4: 44.876 ± 13.892 μV) exhibited changes with the arm weights that were statistically inconclusive ($\alpha_{adjusted} < P < 0.05$) using Hochberg correction. In healthy subjects, non-dominant side posterior deltoid iEMG was statistically inconclusive (P = 0.022, C1: 24.985 ± 29.955; C2: 25.374 ± 28.518; C3: 30.126 ± 31.652; C4: 28.877 ± 33.346 μV). When individual subject gait speeds were explored using descriptive statistics and effect sizes, some subjects exhibited a potentially clinically meaningful improvement.
CONCLUSIONS: The observed increases in gait performance demonstrated encouraging results for higher functioning stroke patients who exhibit gait impairment and asymmetry. The addition of arm weights merits further investigation as a potential rehabilitation intervention in people with stroke-related gait disturbances.

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Application of the Cervical Flexion Relaxation Ratio to Investigate the Impact of Torso-borne Load Redistribution

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Students and military personnel often carry heavy torso loads (e.g. backpacks) which can lead to pain in the shoulders and back. To minimize pain associated with torso loads, load redistribution devices have been developed to off-load weight from the shoulders to the hip. Previous studies have used the cervical flexion relaxation ratio (cFRR), a measure of muscle activity between the extension and flexion phase of forward head motion, to correlate backpack loads with the potential of developing neck pain.
PURPOSE: Using the cFRR, assess the impact of redistributing torso-borne loads and whether changes in cFRR are observed following prolonged load carriage.
METHODS: Twelve volunteers walked at 1.34 $m \cdot s^{-1}$ at 0% grade for 40 min while wearing a torso-borne baseline load of 27 kg and two load distribution conditions to offload shoulder pressure. Flexible pressure sensors monitored pressure distribution at the shoulders and hips. To capture cFRR, bilateral EMG sensors with integrated tri-axial accelerometers were placed on the cervical erector spinae muscle bellies. EMG data were sampled at 2 kHz, demeaned, band pass filtered from 30 to 500 Hz, and full