

Supplemental Digital Content

RESULTS FOR CONSTRAINED GAIT TRIALS

Relative effort and joint torques during constrained gait exhibited the same local peaks as during self-selected gait (Figure S1). Gait speed and step length exhibited no obesity x age interactions, and no main effects of obesity or age (see Table S1 for all p -values).

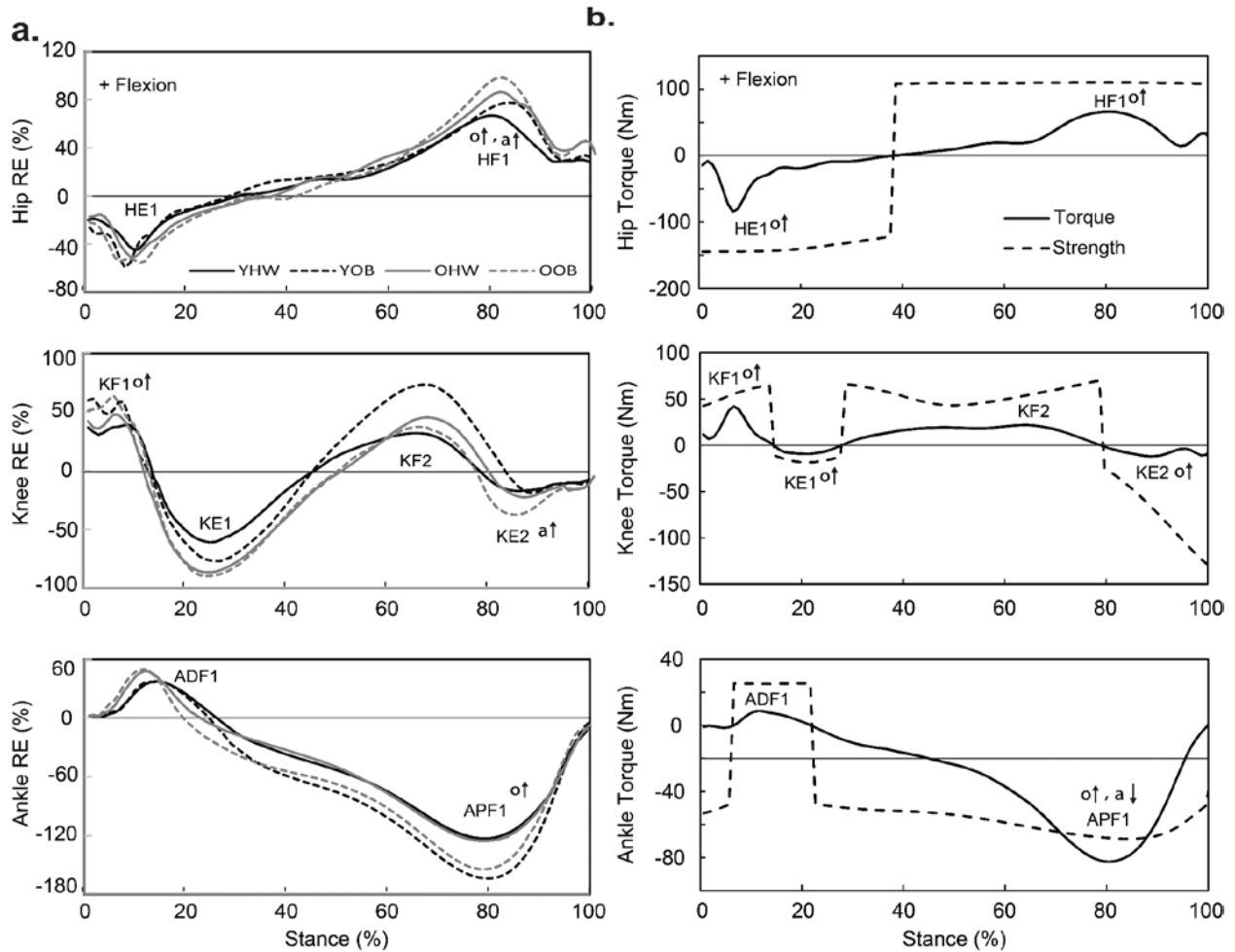


Figure S1. a) Group ensemble averaged relative effort for each subject group over the normalized stance phase of constrained gait. b) Representative joint torque from a single subject over the normalized stance phase of constrained gait. Positive values indicate flexor dominance, and negative values indicate extensor dominance. The symbol “o” indicates a statistically significant ($p < 0.05$) main effect of obesity, “a” indicates a main effect of age, and “a*o” indicates an

interaction effect. Up arrows indicate higher among women who were obese compared to healthy-weight women, or higher among older than young women. Down arrows indicate lower among women who were obese compared to healthy-weight women, or lower among older than young women. Each localized peak is labeled with a unique abbreviation identifier that is used in subsequent Tables: HE = hip extension; HF = hip flexion; KF = knee flexion; KE = knee extension; ADF = ankle dorsiflexion; APF = ankle plantar flexion.

Peak relative effort exhibited no obesity x age interactions during constrained gait, but did exhibit main effects of obesity and age (see Table S1 for all *p*-values). Regarding main effects of obesity, peak relative effort among the women who were obese was 16% higher in hip flexion, 29% higher in knee flexion, and 33% higher in ankle plantar flexion compared to healthy-weight women. Regarding main effects of age, peak relative effort among older subjects was 23% higher in hip flexion, and 16% higher in knee extension compared to young women.

Joint torque at peak relative effort exhibited no obesity x age interactions during constrained gait, but did exhibit main effects of obesity and age (see Table S2 for all *p*-values). Regarding main effects of obesity, joint torque at peak relative effort among women who were obese was 30-39% higher at the hip, 41-46% higher at the knee, and 41% higher in ankle plantar flexion compared to healthy-weight women. Regarding main effects of age, joint torque at peak relative effort among older women was 14% lower in ankle plantar flexion compared to young women.

Strength at peak relative effort exhibited no obesity \times age interactions during constrained gait, but did exhibit main effects of obesity and age (see Table S3 for p -values). Regarding main effects of obesity, strength at peak relative effort among women who were obese was 16% higher in hip flexion and 15% higher in ankle dorsiflexion compared to healthy-weight women. Regarding main effects of age, strength at peak relative effort among older women was 16-26% lower at the hip, 20-38% lower at the knee, and 16% lower in ankle dorsiflexion compared to young women. Results are summarized in Table S4.

Table S1. Gait characteristics and peak relative effort (% available strength) during constrained gait [Least squares means (SE)].

	Healthy-weight	Obese	Obesity <i>p</i>-value	Young	Older	Age <i>p</i>- value	Obesity × Age <i>p</i>- value
Gait speed (m/sec)	1.47 (0.01)	1.48 (0.01)	.547	1.50 (0.01)	1.46 (0.01)	.088	.407
Step length (m)	0.65 (0.00)	0.65 (0.00)	.836	0.65 (0.00)	0.65 (0.00)	.347	.260
HE1	65 (6)	77 (6)	.170	71 (6)	72 (6)	.878	.609
HF1	80 (6)	96 (6)	.048	76 (6)	99 (6)	.010	.360
KF1	61 (8)	90 (8)	.015	77 (8)	74 (8)	.817	.481
KE1	76 (8)	85 (8)	.461	72 (8)	90 (8)	.144	.647
KF2	41 (10)	55 (10)	.309	54 (10)	42 (10)	.386	.109
KE2	26 (4)	33 (4)	.251	22 (4)	38 (4)	.010	.349
ADF1	48 (6)	52 (6)	.683	46 (6)	54 (6)	.318	.906
APF1	126 (9)	159 (9)	.010	147 (9)	138 (9)	.510	.705

Note: Healthy-weight and Obese values are collapsed across age groups, and Young and Older values are collapsed across obesity groups. Abbreviations refer to the localized peaks in relative effort illustrated in Figure 1: HE = hip extension; HF = hip flexion; KF = knee flexion; KE = knee extension; ADF = ankle dorsiflexion; APF = ankle plantar flexion.

Table S2. Joint torque at peak relative effort (Nm) during constrained gait [Least squares means (SE)].

	Healthy-weight	Obese	Obesity <i>p</i>-value	Young	Older	Age <i>p</i>-value	Obesity × Age <i>p</i>-value
HE1	68.5 (4.6)	89.1 (4.9)	.005	84.3 (4.8)	73.2 (4.8)	.117	.495
HF1	64.9 (3.8)	90.1 (4.0)	<.001	80.4 (3.9)	74.7 (3.9)	.310	.588
KF1	26.7 (1.9)	38.9 (1.9)	<.001	35.4 (1.9)	30.1 (2.0)	.066	.299
KE1	37.1 (4.1)	52.2 (4.2)	.015	45.9 (4.2)	43.5 (4.3)	.691	.368
KF2	16.9 (2.7)	23.8 (2.8)	.084	23.1 (2.8)	17.7 (2.8)	.188	.433
KE2	15.5 (2.2)	22.3 (2.3)	.041	19.0 (2.3)	18.8 (2.3)	.954	.789
ADF1	12.3 (1.4)	14.9 (1.5)	.207	13.8 (1.5)	13.4 (1.5)	.878	.726
APF1	86.5 (3.2)	122.0 (3.3)	<.001	111.9 (3.2)	96.6 (3.3)	.003	.411

Note: Healthy-weight and Obese values are collapsed across age groups, and Young and Older values are collapsed across obesity groups. Abbreviations refer to the localized peaks in relative effort illustrated in Figure 1: HE = hip extension; HF = hip flexion; KF = knee flexion; KE = knee extension; ADF = ankle dorsiflexion; APF = ankle plantar flexion.

Table S3. Strength at peak relative effort (Nm) during constrained gait [least squares means (SE)].

	Healthy-weight	Obese	Obesity <i>p</i>-value	Young	Older	Age <i>p</i>- value	Obesity × Age <i>p</i>- value
<i>HE1</i>	108.5 (6.3)	125.5 (6.7)	.074	127.0 (6.5)	107.0 (6.6)	.040	.944
<i>HF1</i>	86.1 (3.8)	100.1 (4.0)	.017	106.8 (4.0)	79.4 (4.0)	<.001	.159
<i>KF1</i>	46.2 (3.5)	50.3 (3.5)	.411	53.6 (3.5)	43.0 (3.6)	.047	.288
<i>KE1</i>	52.9 (4.8)	66.2 (5.0)	.065	67.0 (4.9)	52.2 (5.1)	.046	.909
<i>KF2</i>	45.0 (3.4)	50.8 (3.5)	.247	52.9 (3.5)	42.8 (3.6)	.056	.166
<i>KE2</i>	71.0 (7.0)	85.7 (7.2)	.151	96.5 (7.1)	60.2 (7.3)	.001	.992
<i>ADF1</i>	26.1 (1.2)	29.9 (1.2)	.033	30.5 (1.2)	25.5 (1.3)	.008	.380
<i>APF1</i>	71.2 (4.4)	81.6 (4.5)	.108	79.8 (4.5)	73.0 (4.6)	.300	.890

Note: Healthy-weight and Obese values are collapsed across age groups, and Young and Older values are collapsed across obesity groups. Abbreviations refer to the localized peaks in relative effort illustrated in Figure 1: HE = hip extension; HF = hip flexion; KF = knee flexion; KE = knee extension; ADF = ankle dorsiflexion; APF = ankle plantar flexion.

Table S4. Summary of results for constrained gait including effect sizes (partial eta squared) for peak relative effort, torque at peak relative effort, and strength at peak relative effort.

Group	Peak relative effort		Torque at peak relative effort		Strength at peak relative effort	
	Obese	Older	Obese	Older	Obese	Older
HE1	.056	<.001	.219↑	.073	.093	.122↓
HF1	.114↑	.185↑	.392↑	.031	.160↑	.413↓
KF1	.161↑	.002	.374↑	.096	.020	.111↓
KE1	.016	.062	.162↑	.005	.097	.112↓
KF2	.030	.022	.085	.050	.039	.103
KE2	.039	.182↑	.117↑	<.001	.060	.268↓
ADF1	.005	.029	.047	<.001	.126↑	.188↓
APF1	.178↑	.013	.639↑	.237↓	.074	.032

Note: Abbreviations refer to the localized peaks in relative effort illustrated in Figure 1: HE = hip extension; HF = hip flexion; KF = knee flexion; KE = knee extension; ADF = ankle dorsiflexion; APF = ankle plantar flexion. Healthy-weight and young subjects were used as basis for effect sizes. Up arrows indicate higher among women who were obese, or among older women ($p < 0.05$). Down arrows indicate lower among women who were obese, or older women ($p < 0.05$).