



Fig. S1 – Comparing model outputs to empirical data in all subjects.

Average trial data are shown for all subjects [N=14, panels A-N] carrying 50% body weight loads on both rigid and compliant poles (left and right columns in each panel, respectively). These data are compared to various model outputs, including vertical centre of mass (CoM) position, vertical load position and spring force calculated from the difference in position times the spring constant of the pole used. The model simulations use input parameters reflecting each subject's data (e.g. body mass, maximum allowable leg length, average forward speed, etc.; see Table S1 for all input parameters). The subjects are arranged in panels A-N in ascending order with respect to their relative step frequency with the compliant pole.

Table S1. Optimization input parameters used to produce simulations for individual subjects and for an average subject.

Subject (N=14)	Body Mass [kg]	Leg Length [m]	Forward Speed [m s ⁻¹]					Step Frequency [Hz]					Pole Stiffness [kN m ⁻¹]
			C, 0%	R, 30%	C, 30%	R, 50%	C, 50%	C, 0%	R, 30%	C, 30%	R, 50%	C, 50%	
A	50.0	0.754	1.22	1.11	1.20	1.18	1.31	1.88	1.77	1.84	1.85	1.93	8.36
B	39.5	0.659	0.96	0.96	1.03	0.98	1.06	1.91	1.96	1.96	2.01	2.03	6.84
C	49.0	0.837	1.05	1.01	1.01	0.95	0.88	1.80	1.80	1.80	1.83	1.69	5.00
D	46.0	0.741	1.06	1.03	1.08	1.14	1.14	1.86	1.85	1.86	1.96	1.97	5.98
E	49.0	0.749	1.14	1.39	1.22	1.39	1.32	1.88	2.07	2.04	2.24	2.11	6.56
F	44.5	0.667	1.07	1.01	1.03	1.07	1.08	1.91	1.93	2.02	2.10	2.07	5.50
G	56.5	0.848	1.32	1.31	1.27	1.26	1.22	1.75	1.76	1.75	1.79	1.84	5.32
H	49.5	0.761	1.23	1.26	1.21	1.29	1.30	1.94	1.91	1.86	1.93	1.97	5.30
I	49.0	0.684	1.15	1.10	1.09	1.11	1.20	1.87	2.00	1.95	2.06	2.06	5.50
J	46.0	0.698	0.99	0.90	1.02	0.95	0.97	1.88	1.89	1.92	1.94	1.98	3.66
K	53.0	0.766	1.44	1.31	1.29	1.33	1.38	2.03	2.03	2.06	2.04	2.16	5.00
L	52.0	0.742	1.42	1.38	1.36	1.40	1.47	2.03	2.06	2.18	2.24	2.41	5.50
M	54.0	0.752	1.01	1.06	1.10	1.16	1.30	1.93	2.14	2.13	2.35	2.36	5.00
N	64.5	0.786	1.22	1.08	1.46	1.17	1.26	1.87	1.91	2.21	2.11	2.18	5.00
Average	50.2	0.746	1.16	1.14	1.17	1.17	1.21	1.90	1.93	1.97	2.03	2.06	5.61

Input parameters used for the optimizations detailed in the manuscript. These parameters match the average values measured for each subject during experiment trials for pole type (R=Rigid Pole, C=Compliant Pole) and loading level (0, 30 and 50% body weight) conditions. The optimizations shown in Fig. S1 use the parameters indicated for a 50% loading level, where the letter under the “Subject” column corresponds to the figure panel in Fig. S1.