Fig. S1. Placebo test results (n=4). Four participants completed the same protocol as the main experimental group, but were given an exotendon with stiffness less than 5% that of a normal exotendon. These participants showed no change in running economy, relative to natural running, with the placebo exotendon (two-tailed one-sample t-tests). Error bars represent one standard deviation.
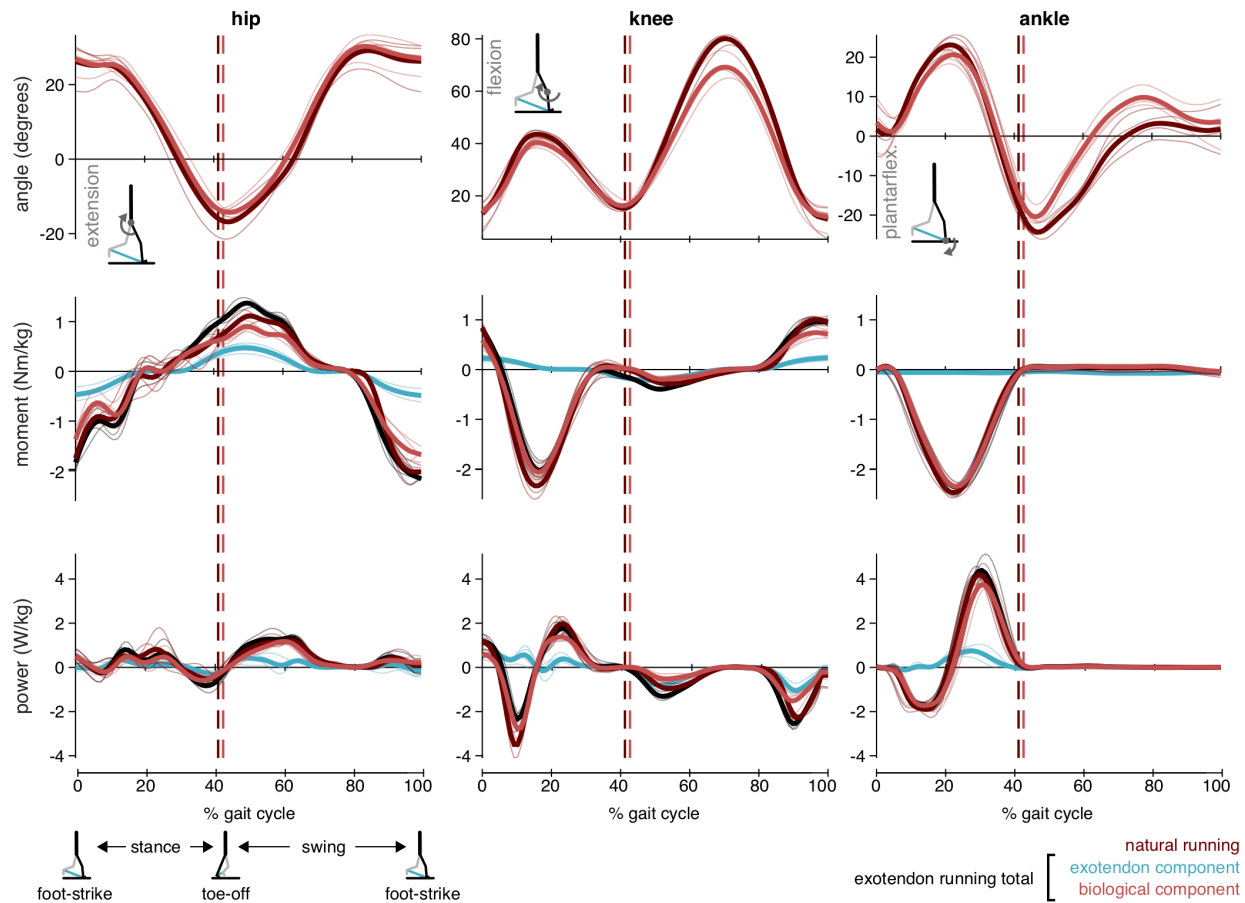
Fig. S2. Joint-level kinematics and kinetics (n=4). Traces show average joint angles, moments, and powers across the gait cycle for natural running (dark red) and exotendon running. Kinetics from exotendon running are separated into exotendon contributions (blue), biological tissue (muscles, tendons, etc.) contributions (light red), and the total joint kinetics (black) for the four participants from Experiment 3. Thin traces show stride-averaged trajectories for individual participants (n=4) while the thick traces show trajectories averaged across participants. Vertical dashed lines indicate across-participant average toe-off time for exotendon running (light red) and natural running (dark red).
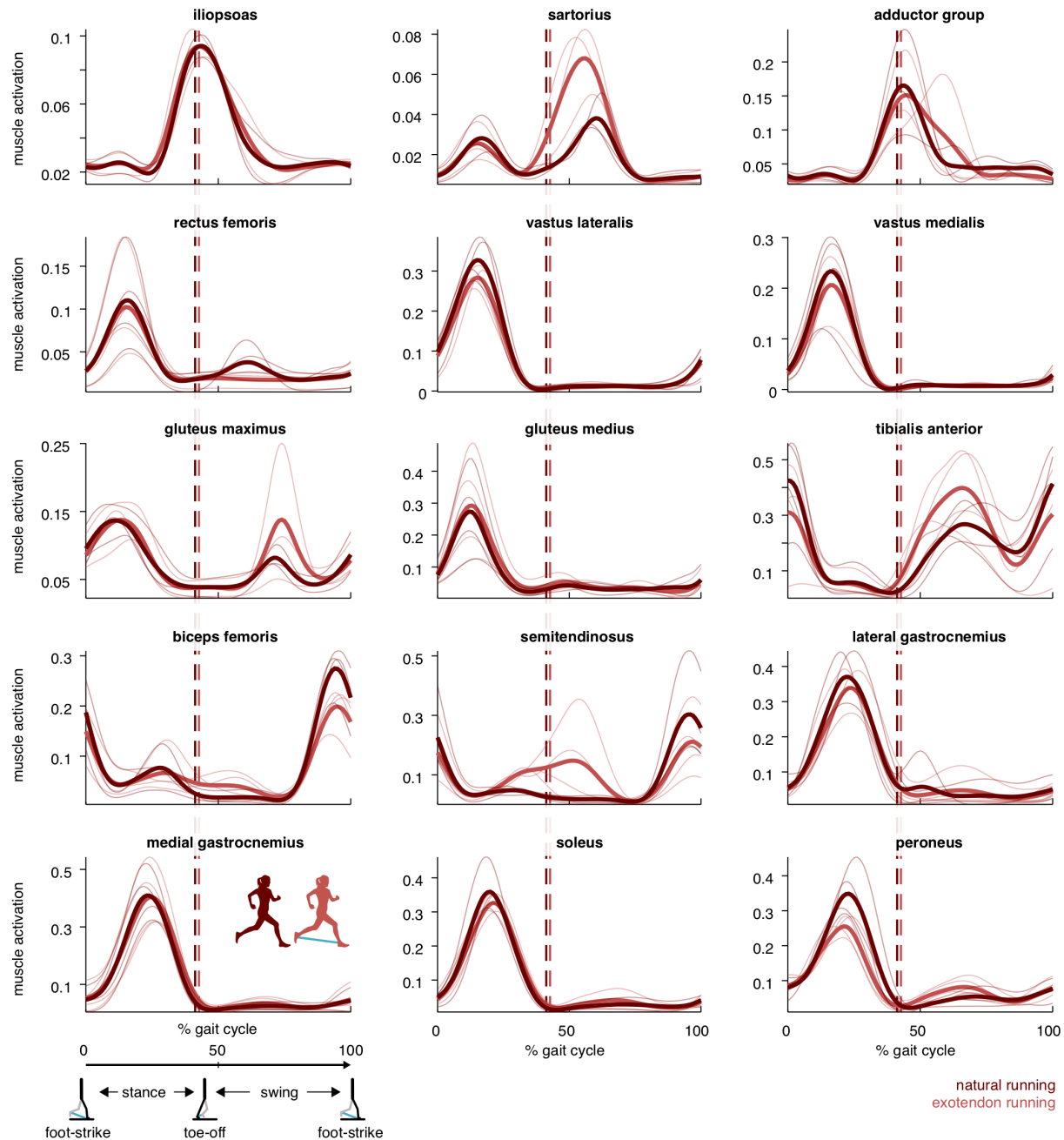
Fig. S3. Muscle activity (n=4). Average muscle activity for each participant (thin traces) and across participants (solid lines) for natural running (dark red) and running with the exotendon (light red) as a function of gait cycle. The vertical dashed lines indicate the average time at which the toe lifts off the ground during exotendon running (light red) and natural running (dark red).
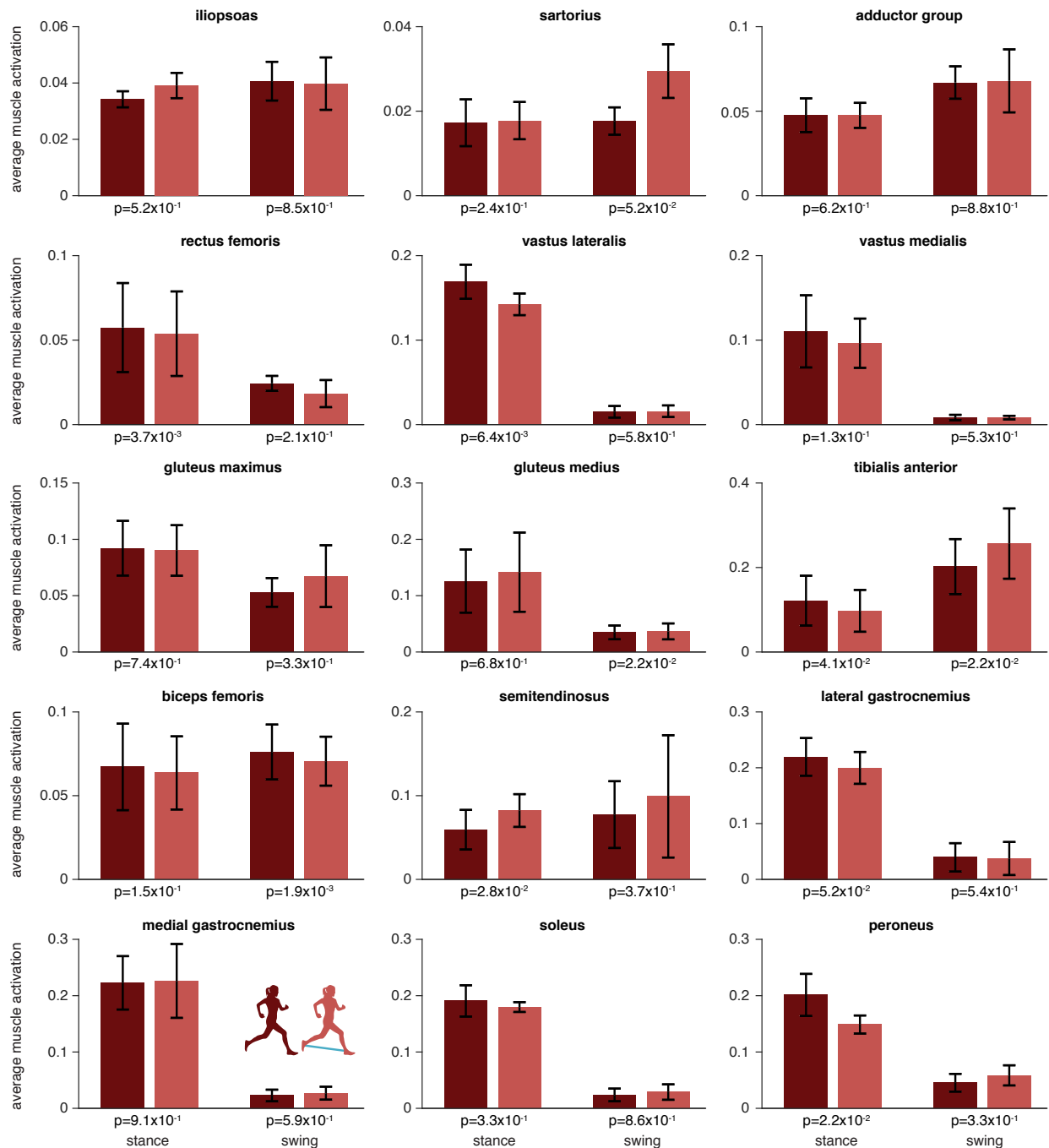
Fig. S4. Average muscle activity (n=4). Comparisons of average, normalized muscle activity, computed from EMG recordings, across stance and swing phases of gait. Statistical comparison (paired t-test with Holm-Šidák corrections, α = 0.05) revealed no significant changes in muscle activity as a result of running with the exotendon.
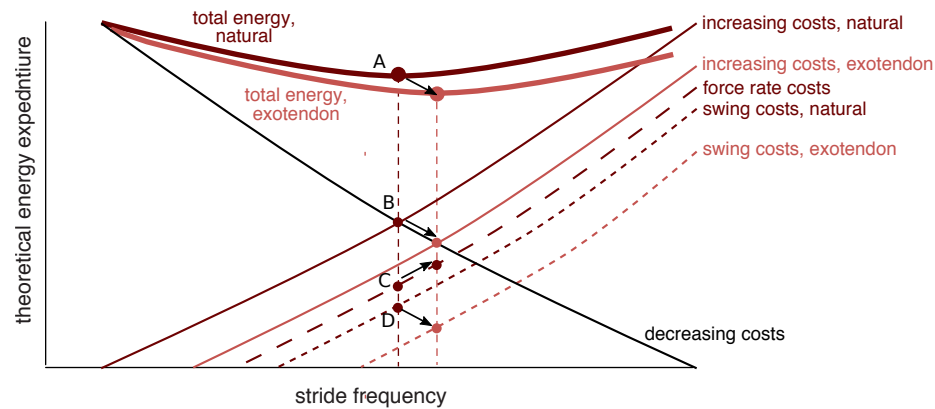
Fig. S5. Exotendon hypothesized mechanism of savings including 'force rate' costs. The total energetic cost (bold, dark red line) comprises costs that increase with stride frequency (thin, dark red line), and costs that decrease with stride frequency (thin, black line). The *increasing costs* can be broken into subcomponents, here *force rate costs* (long dashed, dark red line) and *swing costs* (short dashed, dark red line), although others could be added as well. When the exotendon assists leg swing, the *swing costs* subcomponent line shifts (short dashed, light red line). This in turn shifts the net *increasing costs* line (thin, light red line), resulting in a new total energy curve (bold, light red line), and a new the optimal stride frequency (vertical, dashed light red line). The operating points on the curves of both the *increasing costs* and *decreasing costs* (Point B) as well as on the total energy expenditure curve (Point A) shift down and to the right with the exotendon, as does Point D (the operating point on the curve of the *swing costs* subcomponent of the *increasing costs*). The net savings in energy expenditure occurs despite Point C (operating point on the curve of the *force rate costs*) shifting up and to the right. Thus, even though some costs might increase with adaptation to the exotendon, decreases in other costs can result in net savings.
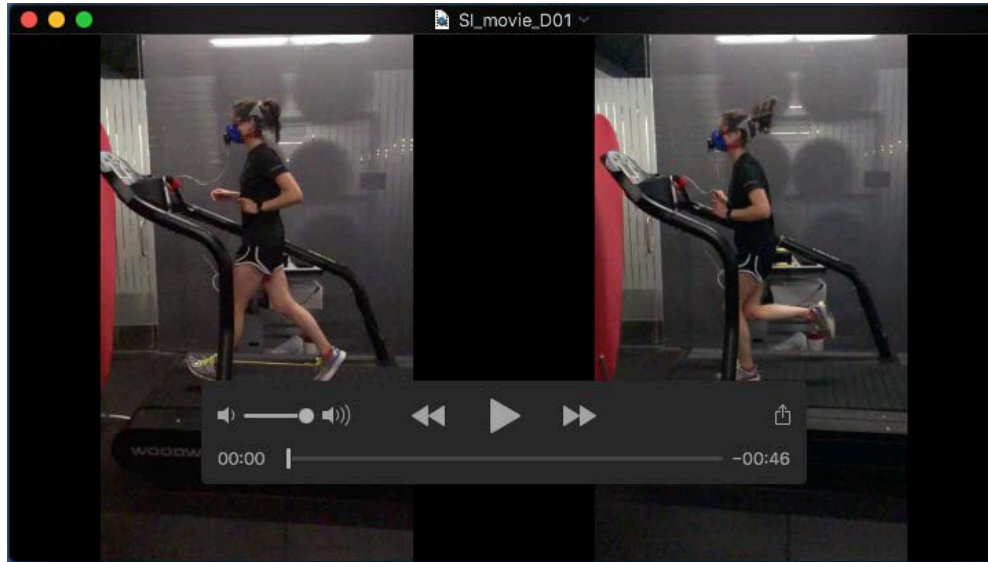
Movie 1. Running with the exotendon.