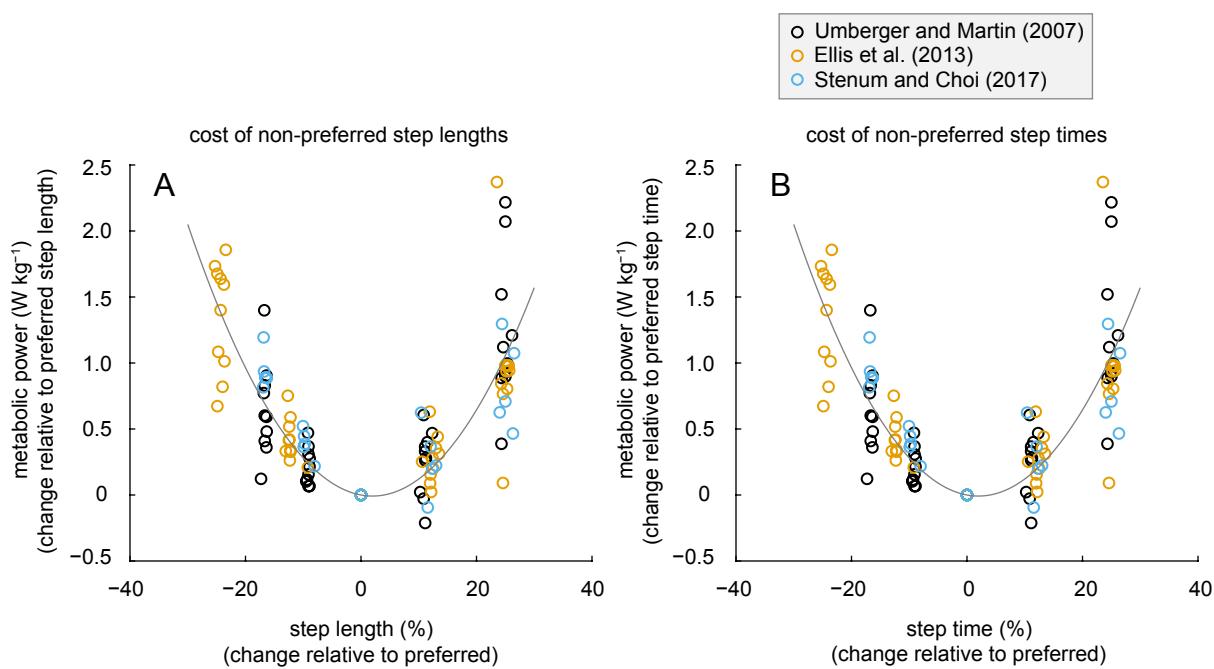
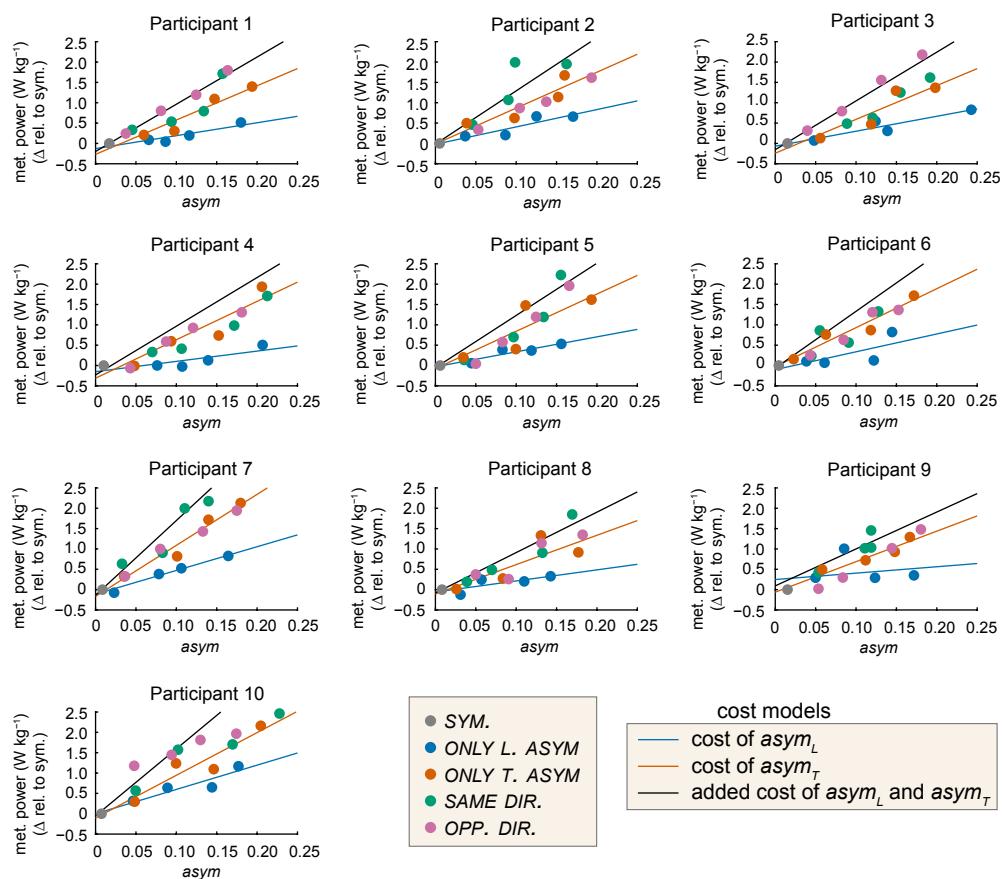


## Supplementary Figure 1



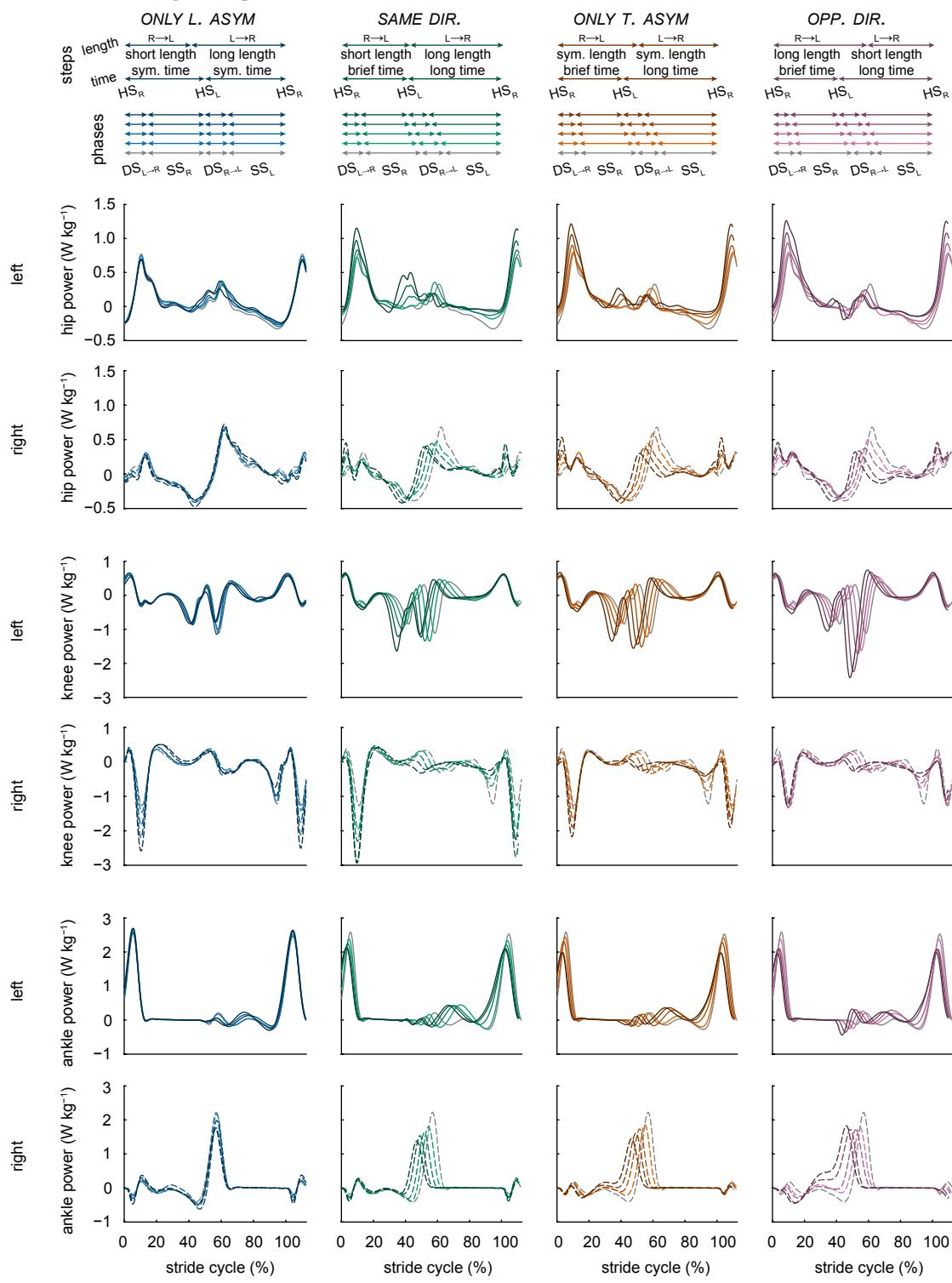
**Figure S1.** Metabolic power of non-preferred step lengths and step times. Quadratic fits to metabolic power of non-preferred step lengths (A) and step times (B) during constant speed treadmill walking were used to build predicted asymmetry costs based on non-preferred steps that were compared with the measured cost of step length asymmetry and step time asymmetry (see Fig. 3). Metabolic power is expressed as the change in net metabolic power relative to its value during walking at the preferred values of step length (A) or step time (B).

## Supplementary Figure 2



**Figure S2.** Individual participants' metabolic power. Cost models are based on linear fits of data in **ONLY L. ASYM** and **ONLY T. ASYM** conditions and are used to predict the measured metabolic power of **SAME DIR.** and **OPP. DIR.** conditions (see Fig. 4).

## Supplementary Figure 3



**Figure S3.** Hip, knee and ankle joint powers. Increased asymmetry is shown by progressively darker line coloring. Grey lines show symmetric condition. Arrows at top of figure show relative durations within in the stride cycle. Steps are denoted  $R \rightarrow L$  and  $L \rightarrow R$  and represent durations from right-to-left heel-strike (HS) and left-to-right heel-strike, respectively. Durations of double support (DS) and single support (SS) phases have subscripts denoting double support phase when transitioning from left-to-right stance ( $L \rightarrow R$ ), right single support phase (R), double support when transitioning from right-to-left stance ( $R \rightarrow L$ ) and left single support phase (L). All lines are ensemble mean ( $N = 10$ ) for a specific level of enforced asymmetry.