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Title: Shared features in panarthropod inter-limb coordination across walking speeds and terrains

Abstract: Tardigrades navigate heterogeneous, fluctuating environments and must utilize locomotive strategies capable of dealing with variable terrain. We find that inter-limb coordination patterns in freely-behaving tardigrades (species: *Hypsibius exemplaris*) replicates several key features of walking in insects. Our results show that phase offset between contralateral leg pairs is flexible, while ipsilateral coordination is preserved across environmental conditions; this further mirrors similar results in insects and crustaceans. Previous studies in *Drosophila* suggest that a single neural control circuit may underlie the spectrum of observed inter-leg coordination patterns (ICPs) across walking speeds. We synthesize data on leg kinematics and inter-leg coordination relationships during forward walking in a range of panarthropod species, and suggest that the controller in *Drosophila* may be shared across the diversity of panarthropod walkers. We propose that observed functional similarities in walking coordination between tardigrades and arthropods is either due to a generalized locomotor control circuit common to panarthropods or to independent convergence onto an optimal strategy for robust multilegged control in small animals with simple circuitry.