

Training propulsion via pulsed robotic assistance



NRI: Goal-Oriented, subject-Adaptive, robot-assisted Locomotor Learning (GOALL)

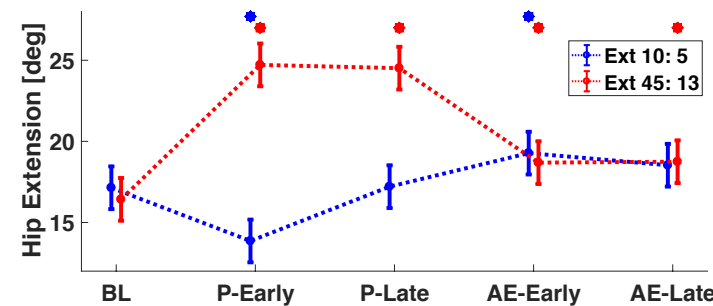
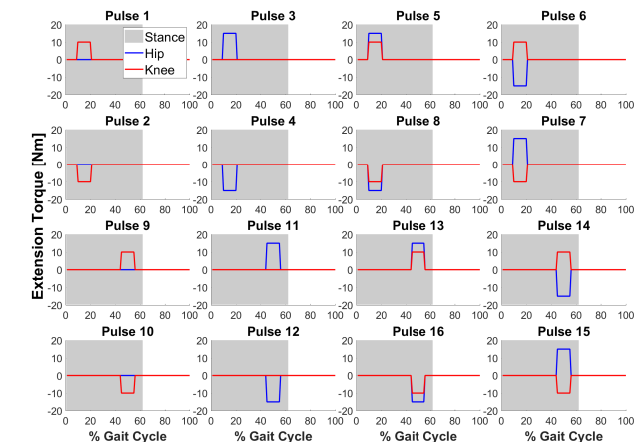
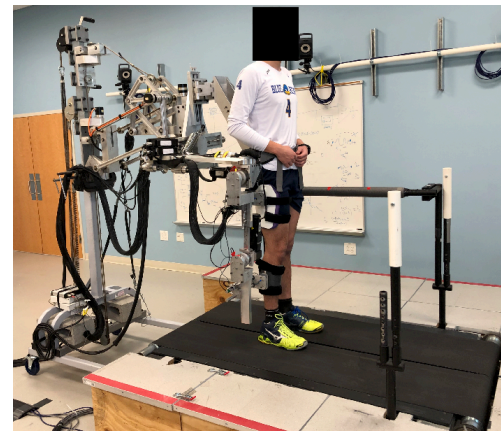
Fabrizio Sergi, University of Delaware

Challenge

- Can we train propulsion using robotic exoskeletons?

Solution

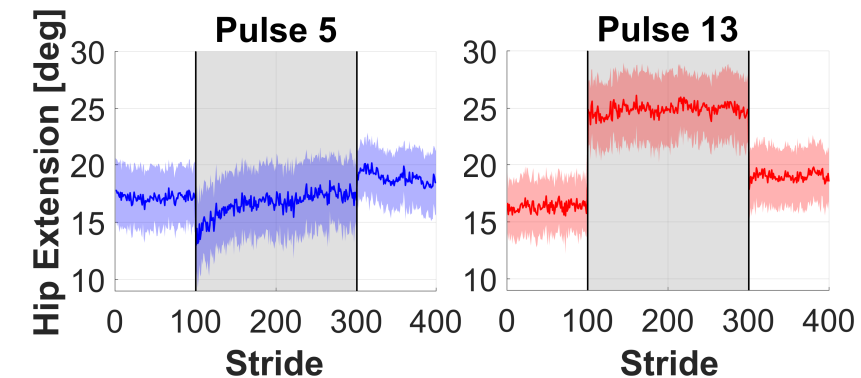
- Pulses of torque via a hip/knee exoskeleton



McGrath et al., PLOS One, 2019

McGrath et al., ICORR 2019

McGrath et al., In prep



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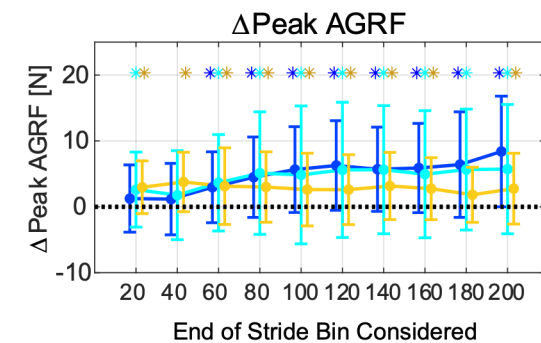
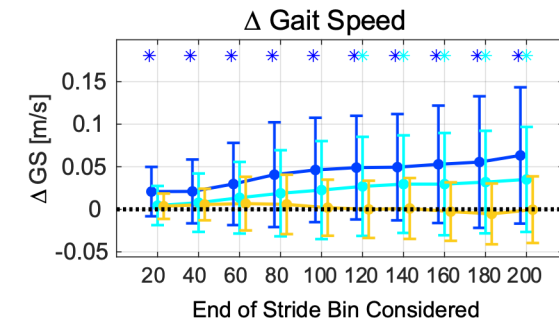
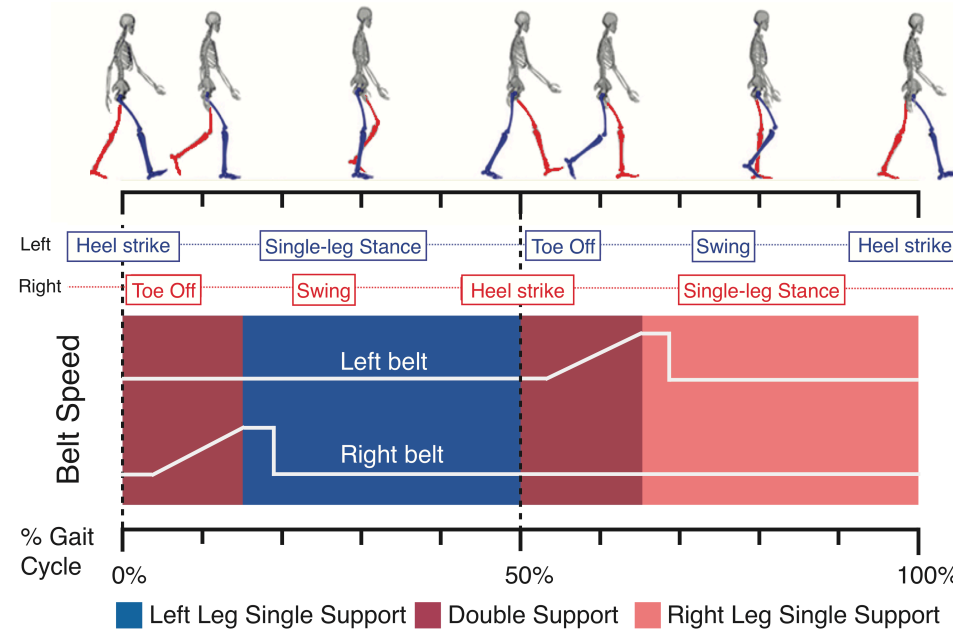
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Challenge

- Can we train propulsion using robotic exoskeletons?

Solution

- Pulses of torque via a hip/knee exoskeleton
- Accelerations of the belt during treadmill walking to modulate posture and propulsive force



Farrens et al., ICORR 2019, Farrens et al., In prep

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Scientific Impact

- New method linking biomechanical analysis to wearable robotics
- After-effects measured after ~10 minutes of robotic training in healthy subjects
- Simple and effective new method for training propulsion using belt accelerations via dynamic distortion

Broader Impact

- Developed methods relevant for post-stroke rehabilitation
- Supported three grads and five undergrads – 3 went to grad school
- Lab tours during National Biomechanics day and other outreach events – visits by 40+ students per year