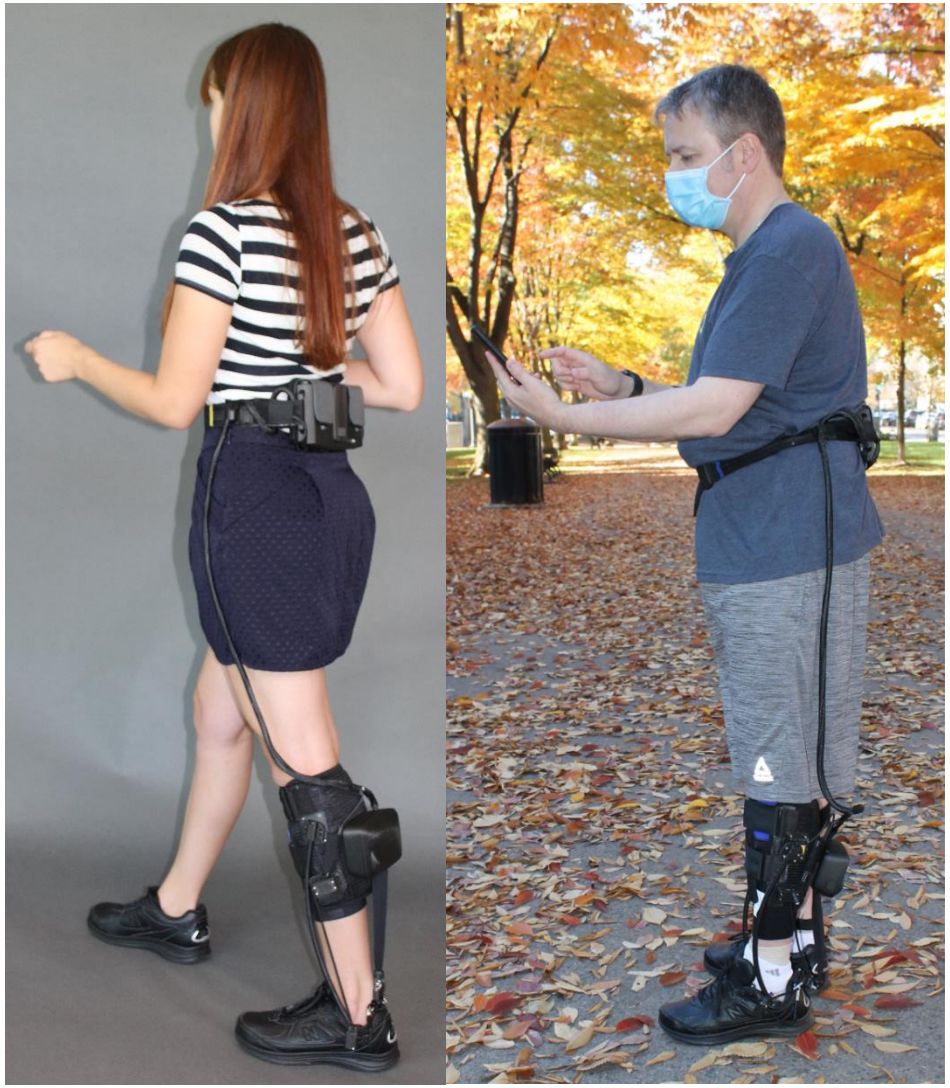
NRI: INT: Wearable Robots for the Community: Personalized Assistance using Human-in-the-loop Optimization



NSF Award #CMMI– 1925085

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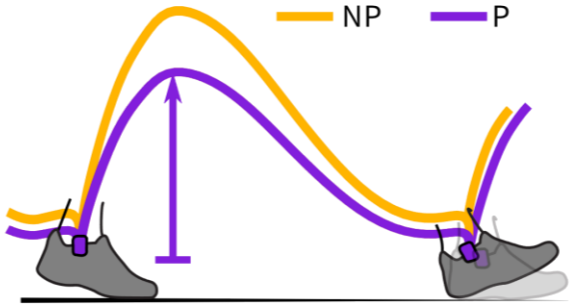
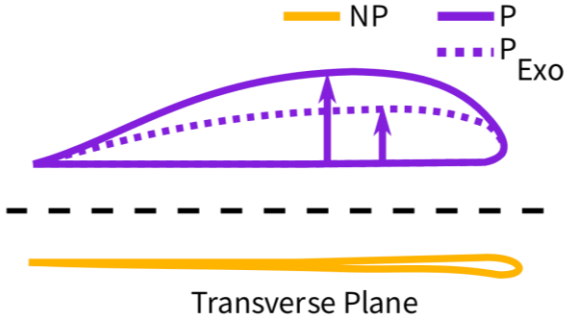
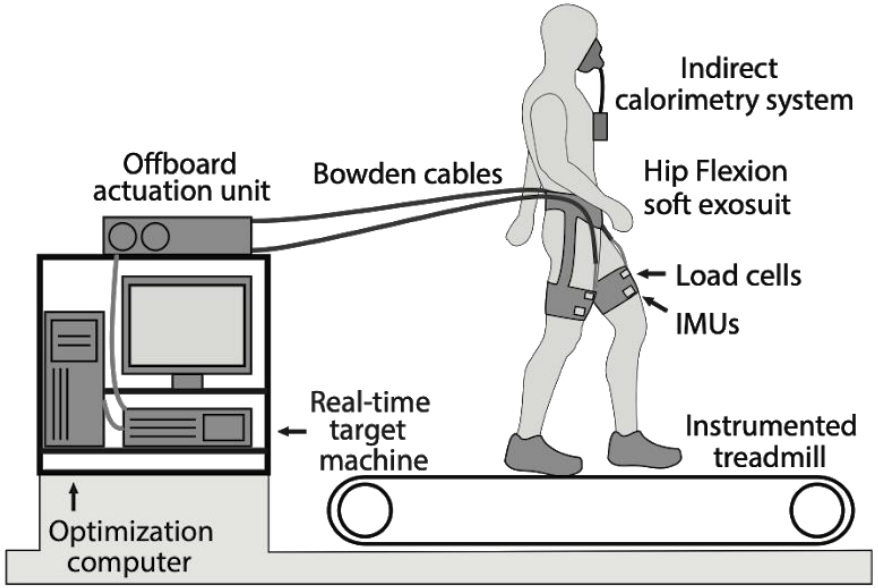
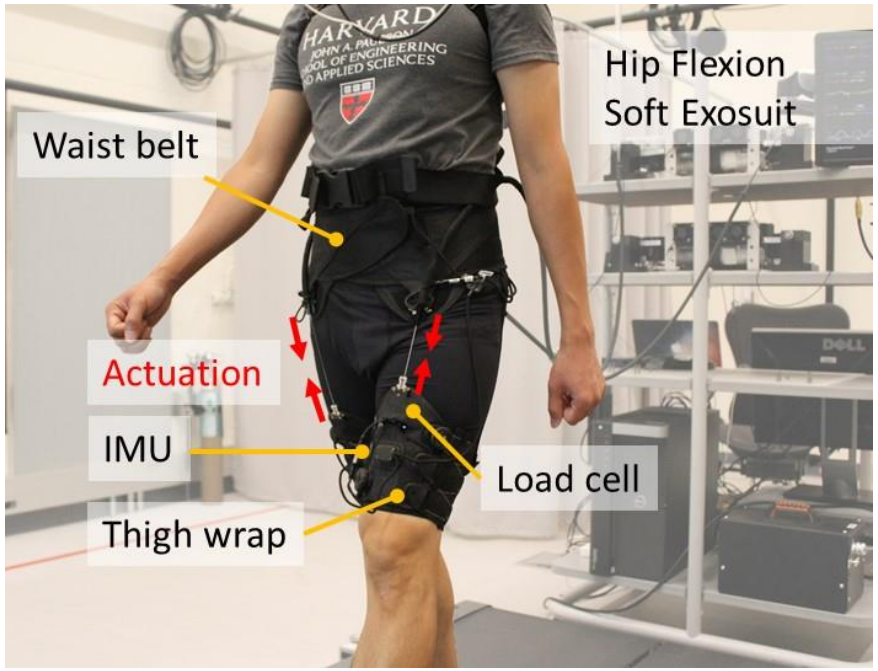
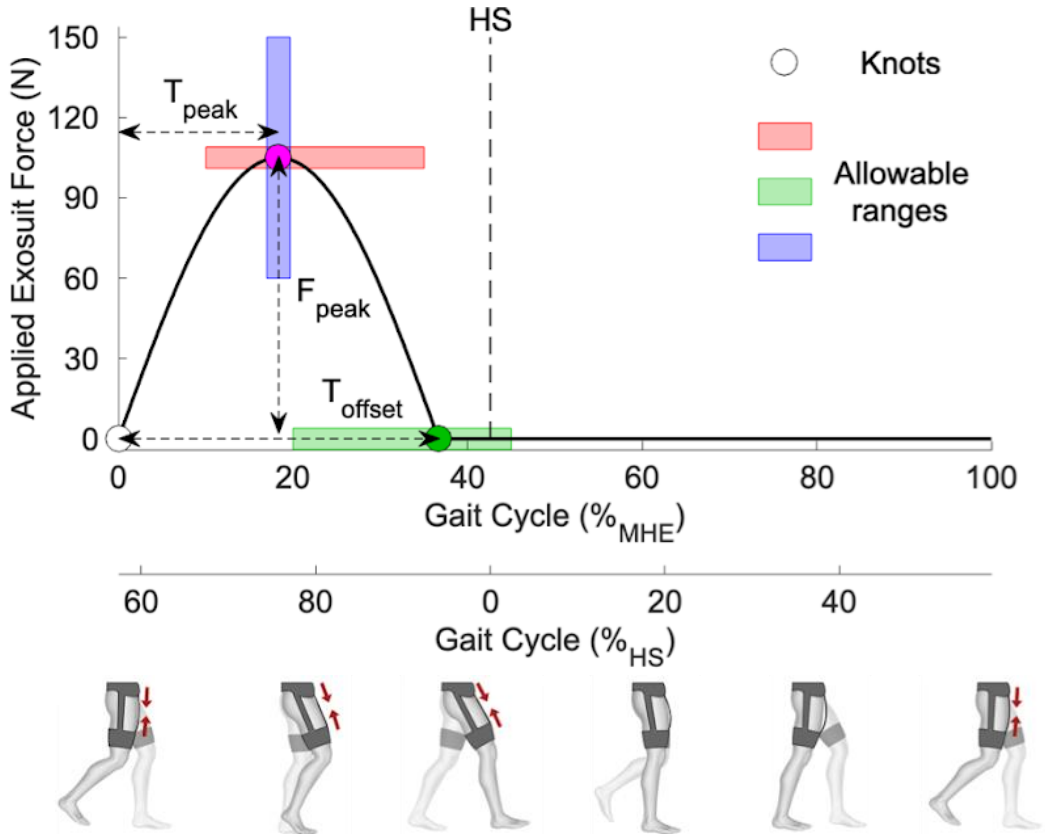




Optimization of Hip Flexion Assistance (Methods)





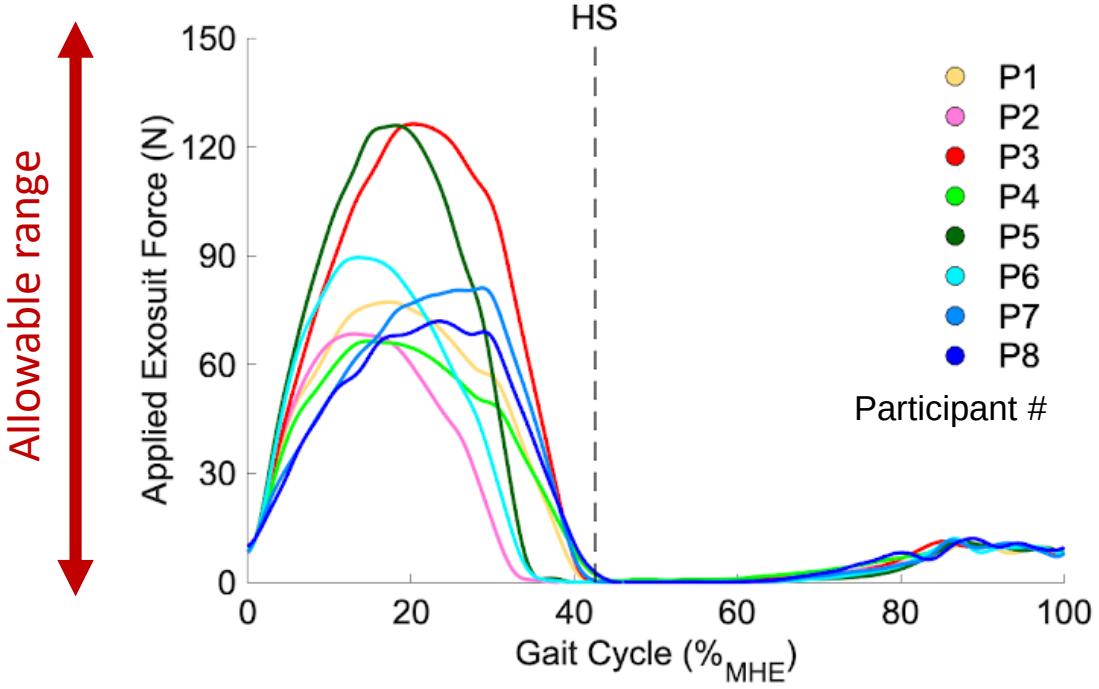


- 8 healthy subjects
- 3 parameters optimization (CMA-ES)
  - Peak timing; Offset timing; Peak force

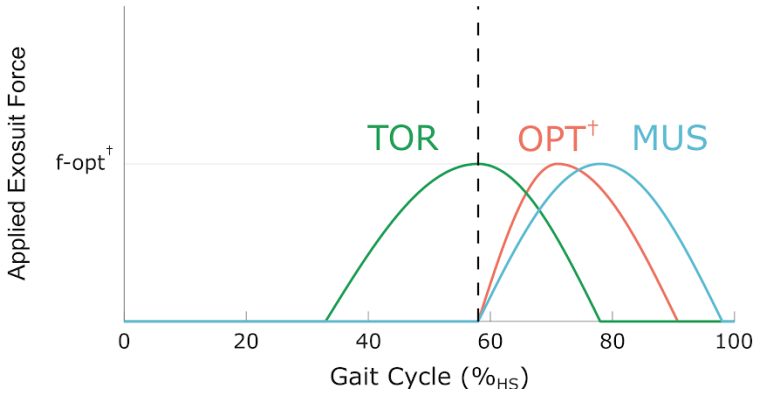
(Zhang, 2017; Ding, 2018)

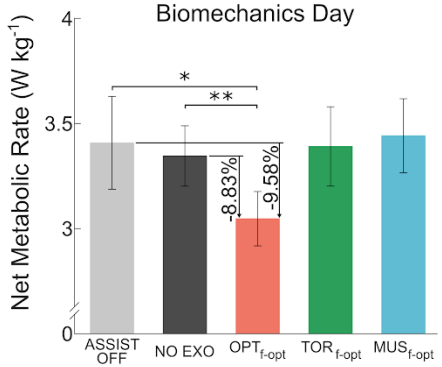
Optimization of Hip Flexion Assistance (Findings)

Finding #1: For 6 out of 8 subjects having a medium force level was found to be optimal as it avoided causing a marching gait

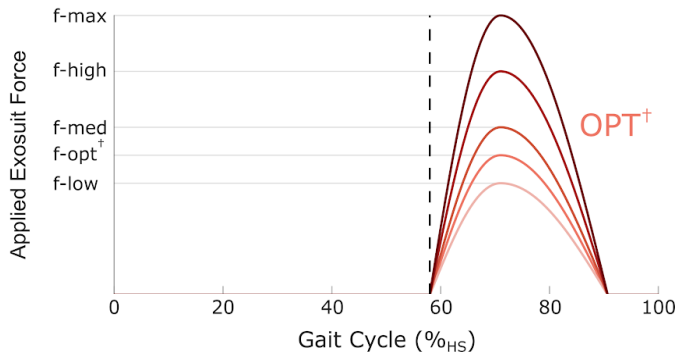


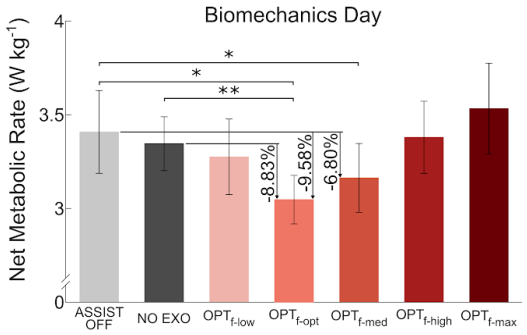
Finding #2: The optimal profile found performed better on average in reducing metabolic cost compared to other commonly used assistive profiles





Finding #3: The optimization was validated in one dimension (max force), further supporting the idea that there is a sweet spot for hip flexion assistance

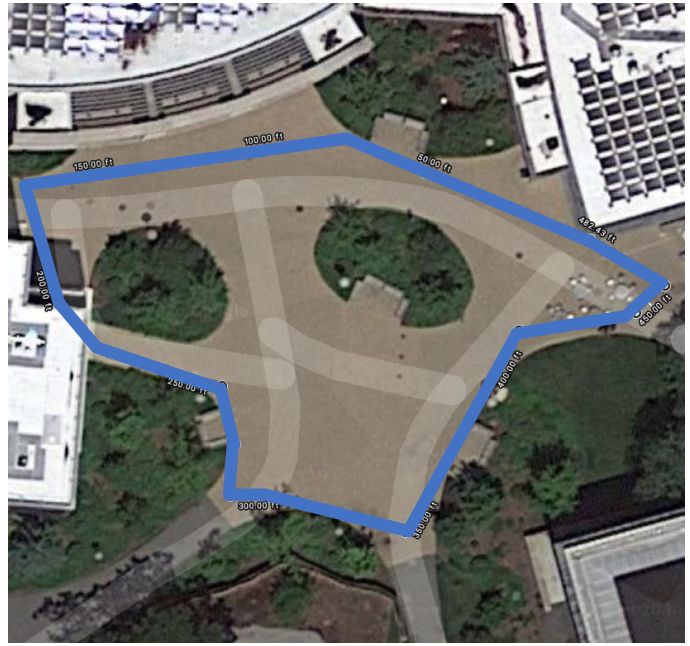


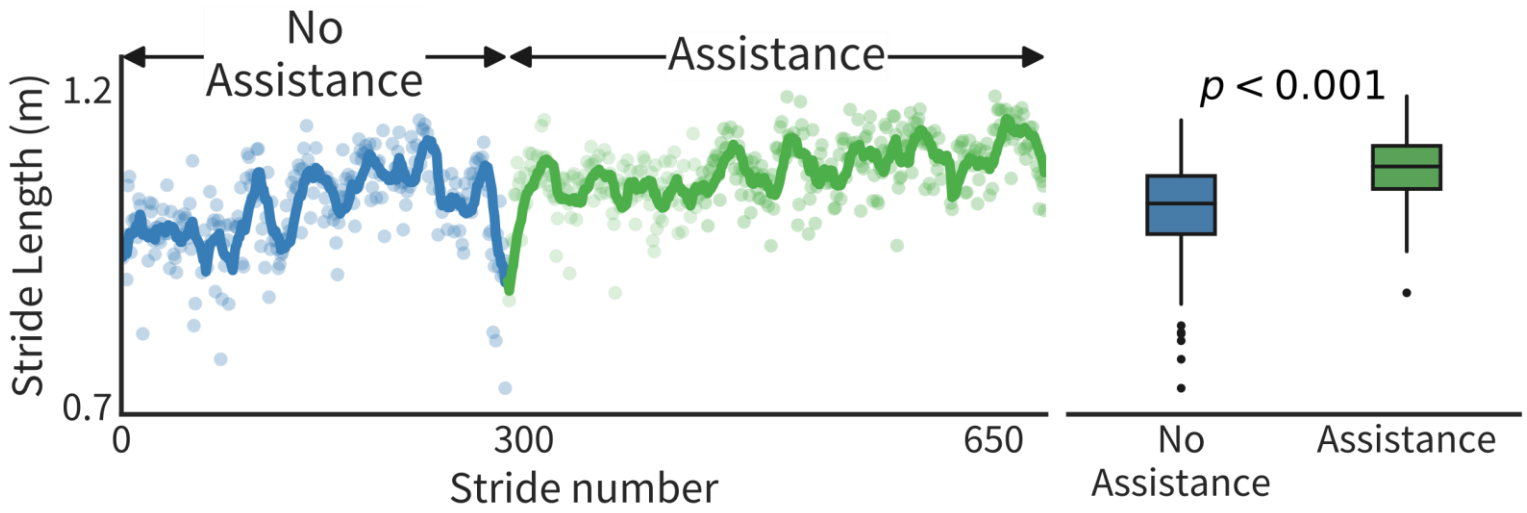


Monitoring of gait improvements in community settings

- Participant walked around 150 m loop

- Sensors detected significant changes in stride length





Arens, P., Siviy, C., Bae, J., Choe, D., Karavas, N., Baker, T., Ellis, T., Awad, L., Walsh, C. Real-time gait metric estimation for everyday gait training with wearable devices in people poststroke. *Wearable Technologies (in press).*