Retention of Propulsion and Gait Mechanics Following Removal of Trailing Limb Posture Biofeedback in Exoskeleton-Assisted Gait

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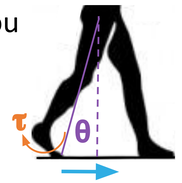
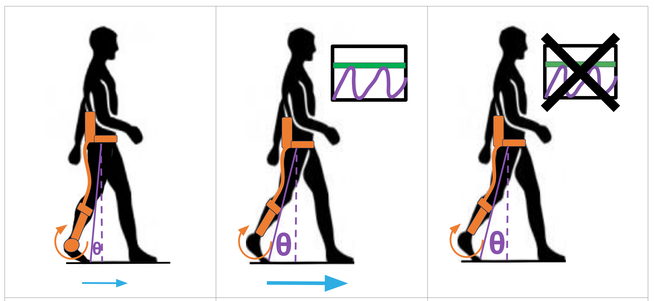
Research Question & Hypothesis

To augment **forward propulsion**, you can manipulate 2 variables:

1. **Plantarflexion Torque (τ)**
2. **Trailing Limb Angle (θ)**





Exo	*Exo + feedback*	*Feedback removed*
↑τ + ↓TLA = no propulsion change	↑τ + ↑TLA = ↑propulsion	?

Purpose: Determine the effects of the removal of **visual feedback of TLA** on the retention of **propulsion** in **exoskeleton-assisted gait**

Hypothesis: Participants would retain improvements in propulsion and TLA, but these gains would gradually move toward baseline

References & Funding

Hsiao et al. (2015), *Hum Mov Sci* 39; Jackson & Collins (2015), *J Appl Physiol* 119(5); Gordon & Ferris (2007), *J Biomech* 40(12); McCain et al. (2019), *J Neuroeng Rehabil* 16(1); Takahashi et al. (2015), *J Neuroeng Rehabil* 12(1)

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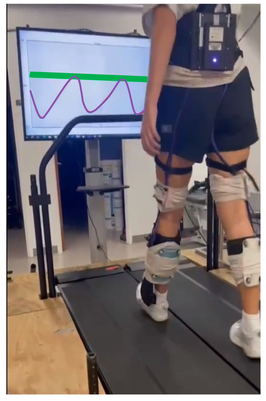
Study Design

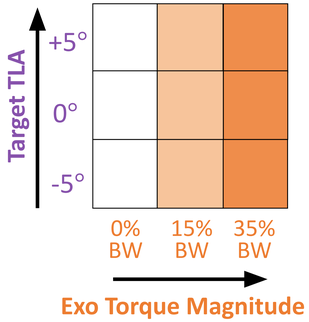
Participants: 8 unimpaired individuals (5 males, 3 females, aged 21 ± 1.8 yrs).

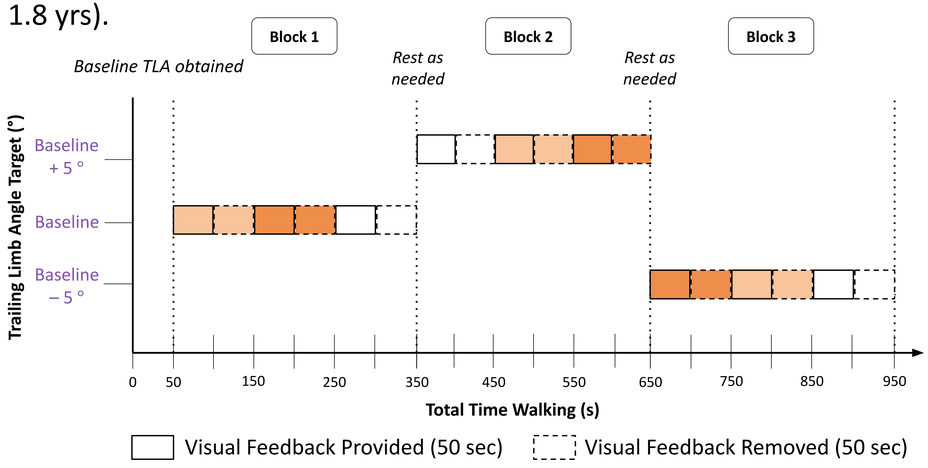
Data Collection: 10 trials of exo-assisted gait at a fixed speed on Bertec treadmill.

Real-time TLA & target TLA (green band) displayed on monitor according to block design.



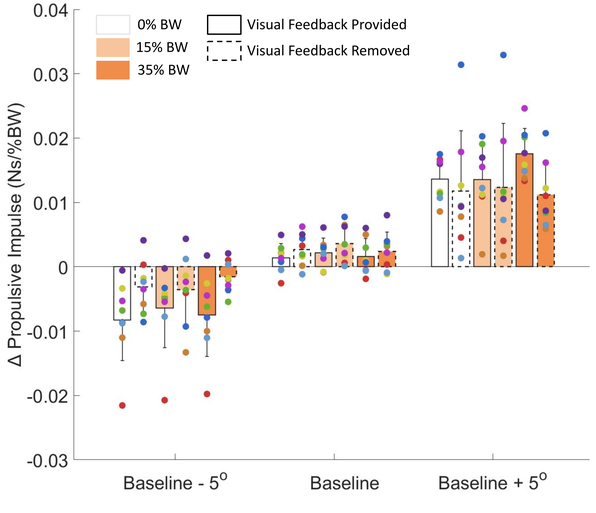
Block Design:



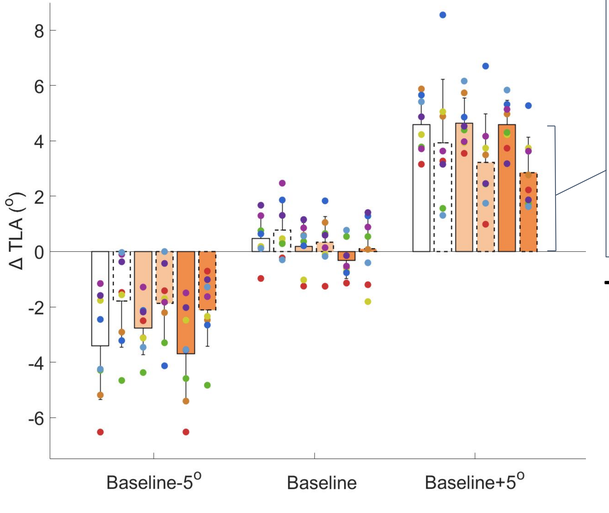


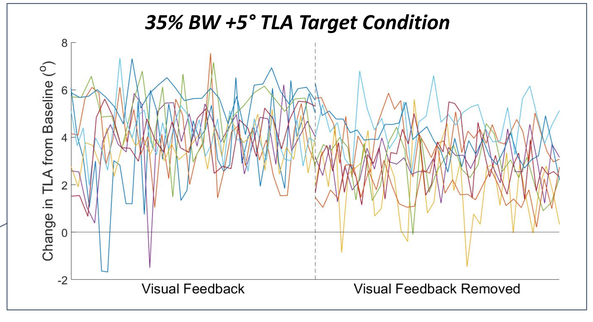
Results

Change in Propulsion With and Without Feedback



Change in TLA With and Without Feedback





Takeaways:

- Short-term retention of propulsion and TLA was seen after feedback removal.
- TLA and propulsion trended toward baseline, suggesting a return to default gait patterns despite brief explicit learning.