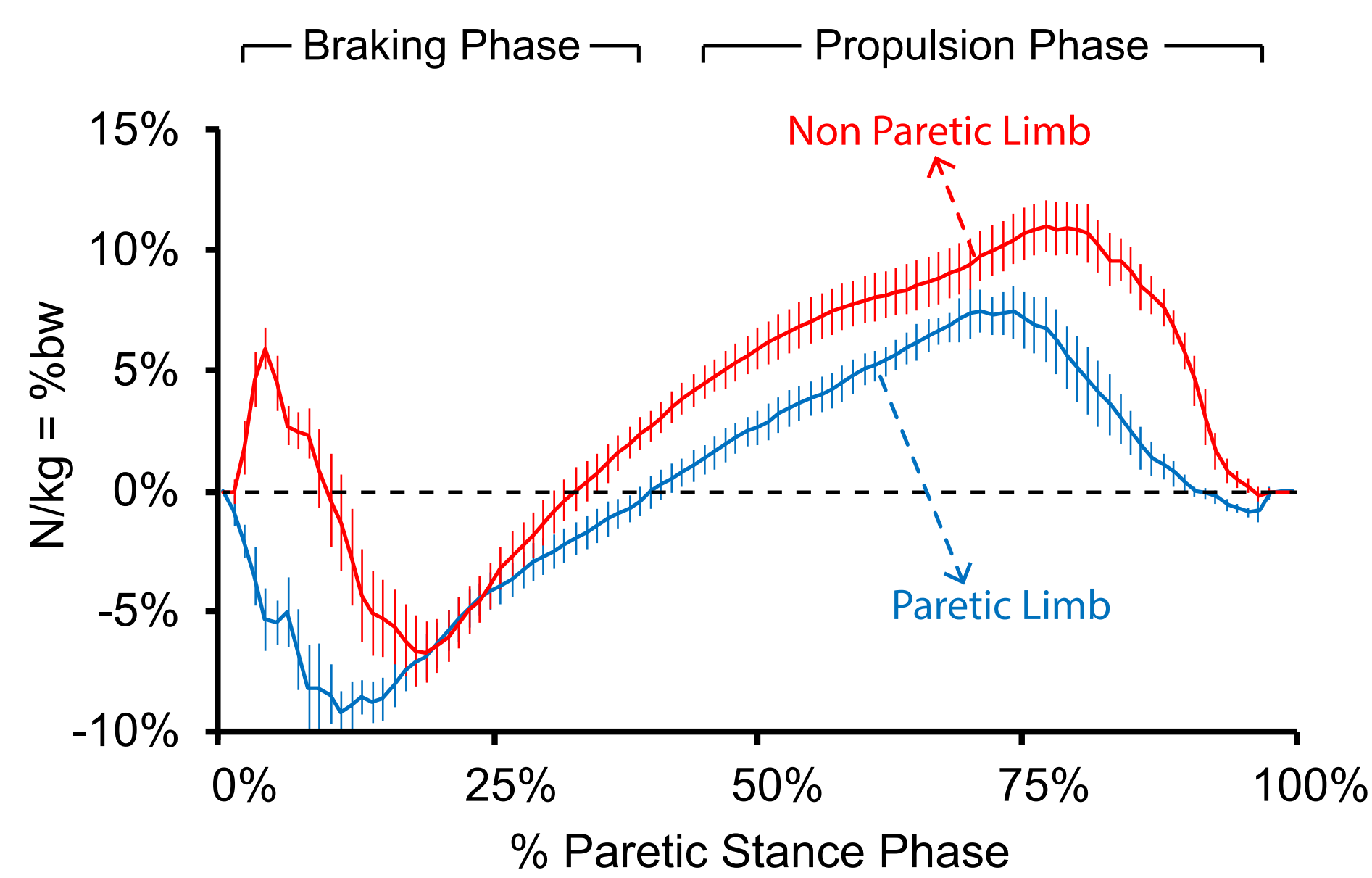


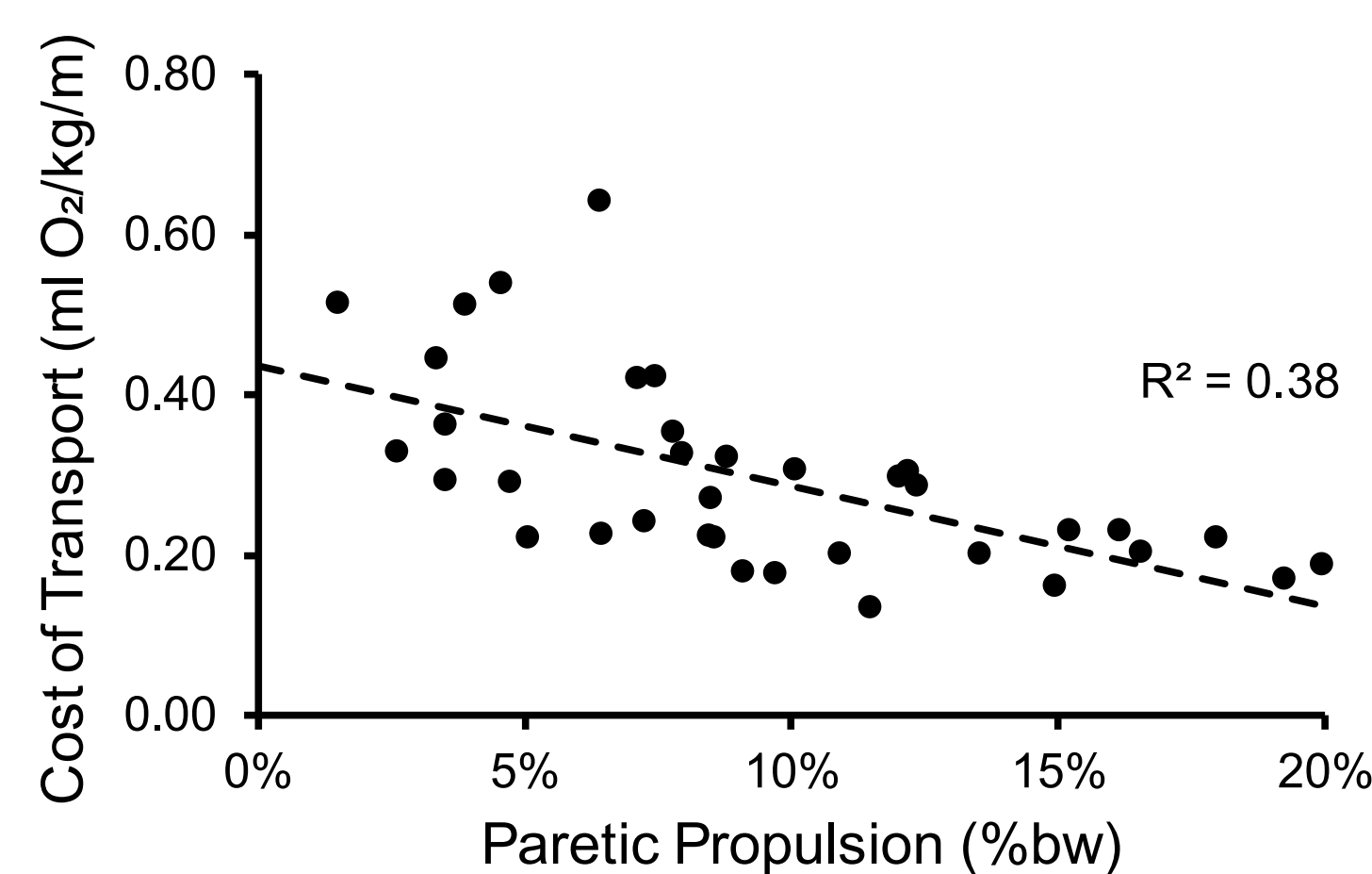
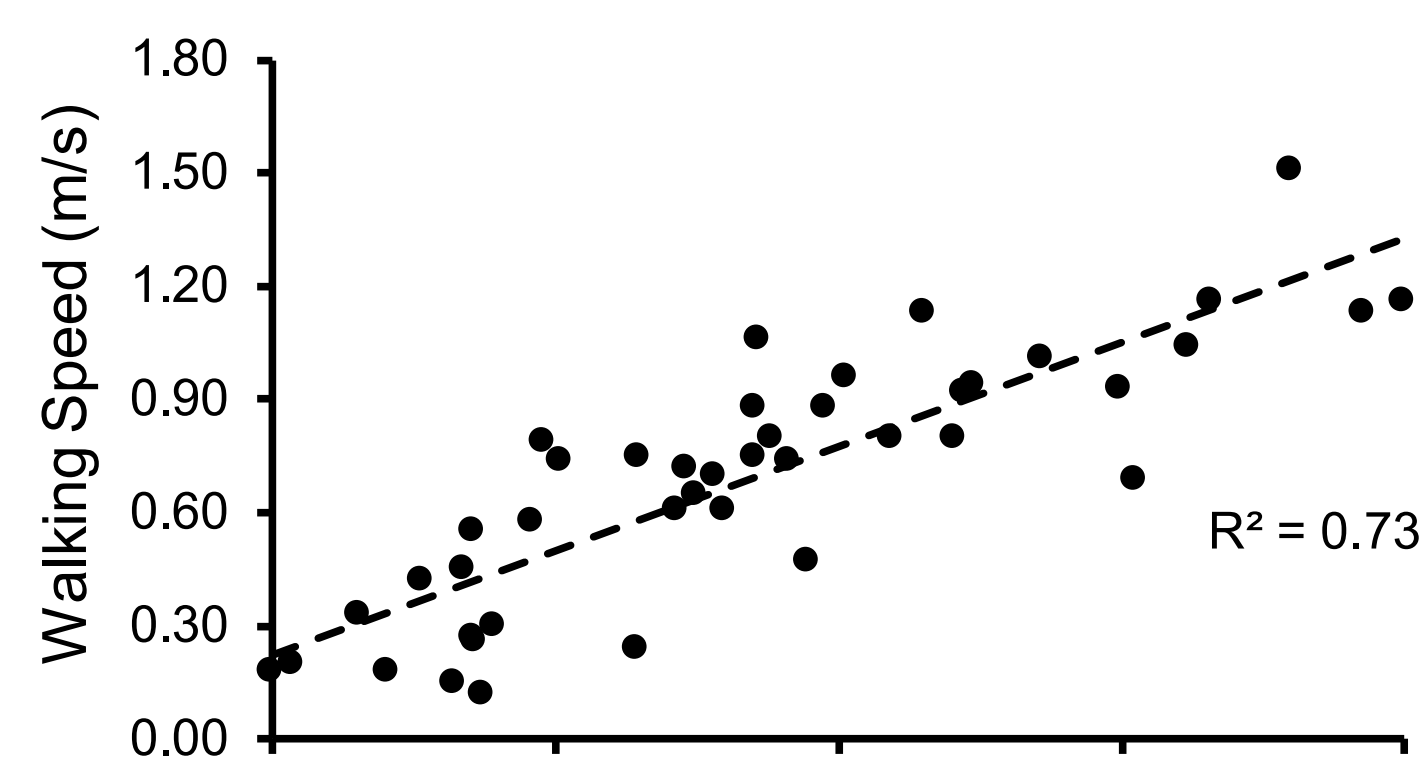
FastFES Targeted Locomotor Training After Stroke

Louis Awad, PT, DPT, PhD¹; Darcy Reisman, PT, PhD²; Stuart Binder-Macleod, PT, PhD²
¹Boston University, Department of Physical Therapy & Athletic Training, Boston, MA
²University of Delaware, Department of Physical Therapy, Newark, DE

The Problem



After stroke, weakness and impaired control of the paretic limb contribute to an impaired ability to generate forward propulsion during walking.



Reduced paretic propulsion is related to slow walking and poor walking economy—factors that reduce function and quality of life.

Objective

To develop and test a novel gait retraining program that targets deficits in paretic propulsion in a manner that improves walking function and energetics after stroke.

The Study

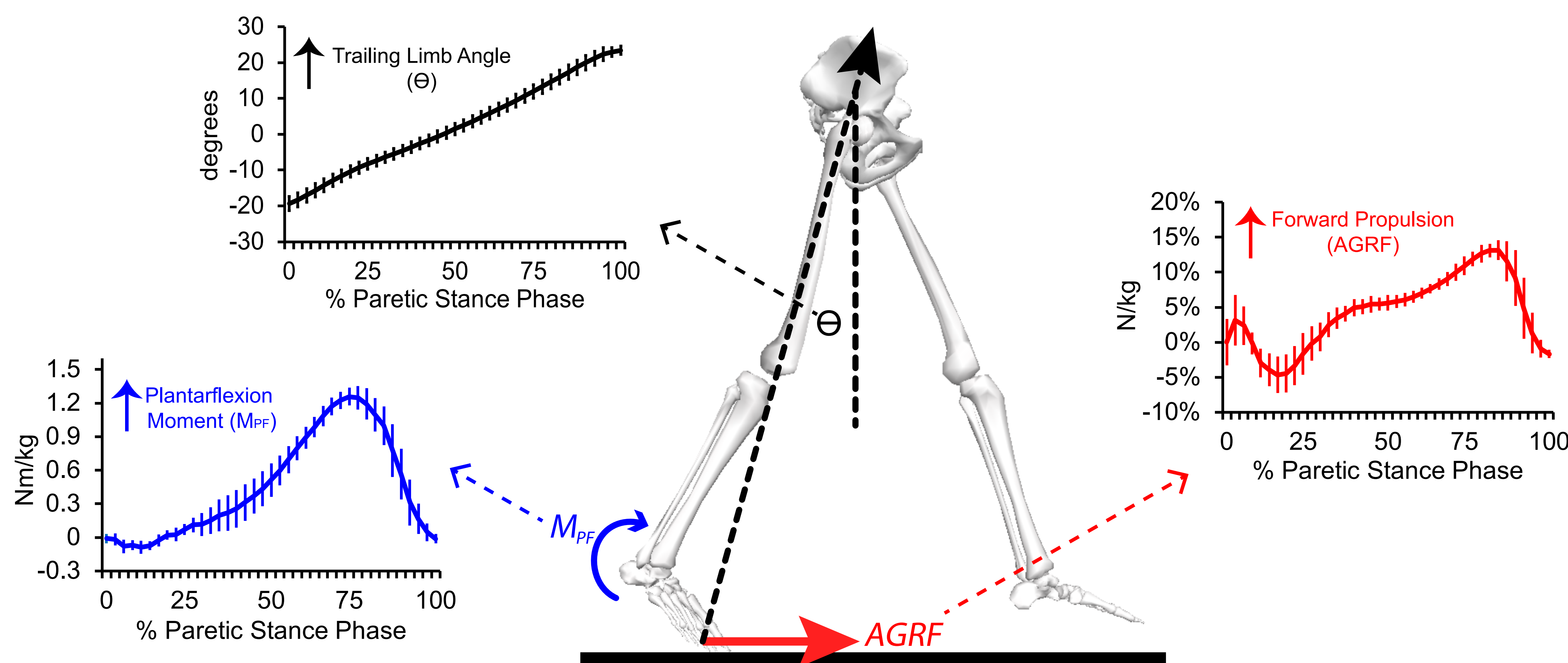
Design:
45 individuals with chronic stroke participated in a randomized controlled study of:

- 1) FastFES (experimental group)
- 2) Fast speed training
- 3) Self-selected speed training

Outcomes:

- Cost of transport, measured as oxygen consumption ($\text{ml O}_2/\text{kg}$) per meter walked ($\text{ml}/\text{kg}/\text{m}$) and analyzed independent of changes in walking speed
- Walking function (e.g. speed and distance)

Biomechanical Framework

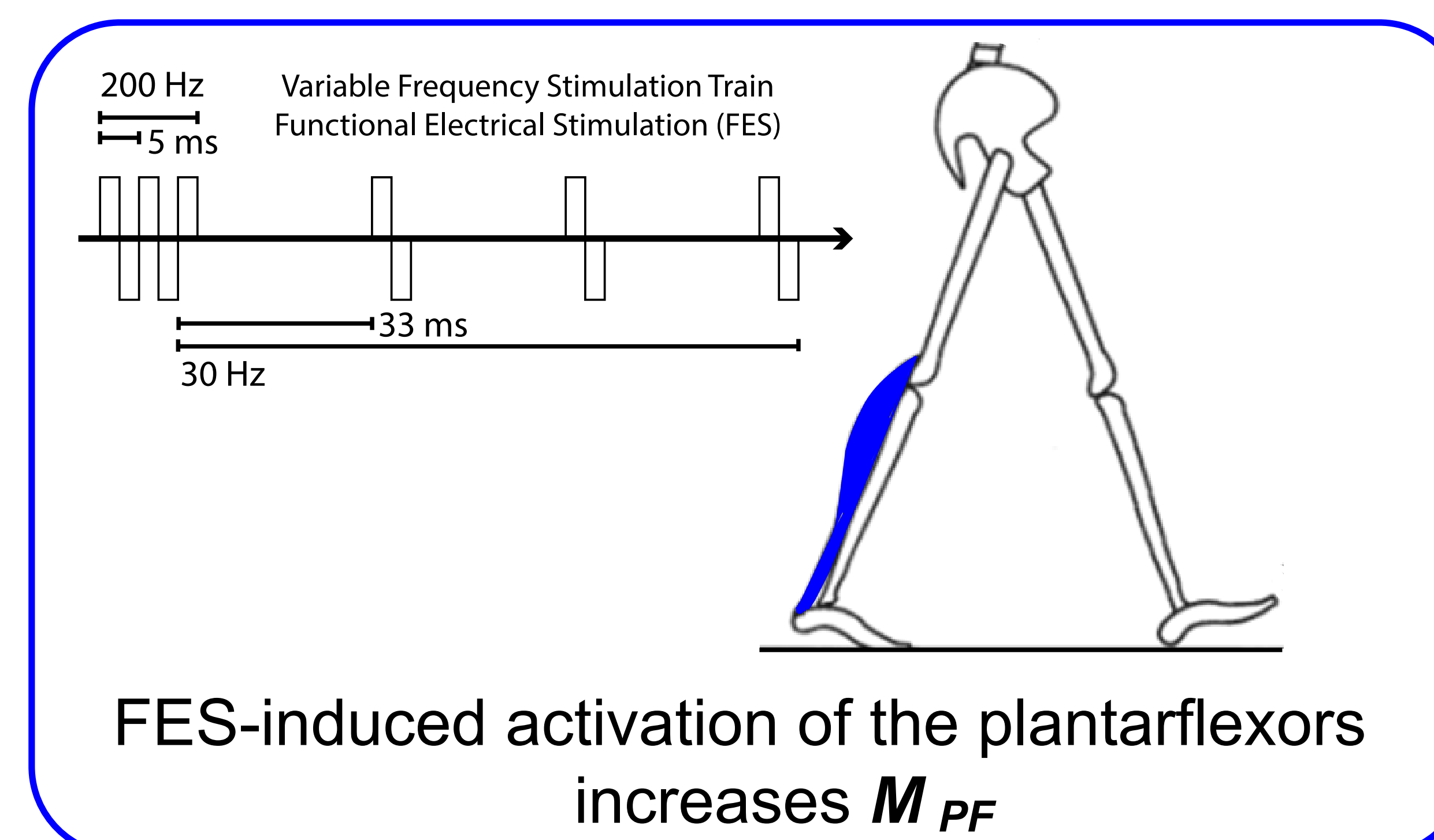
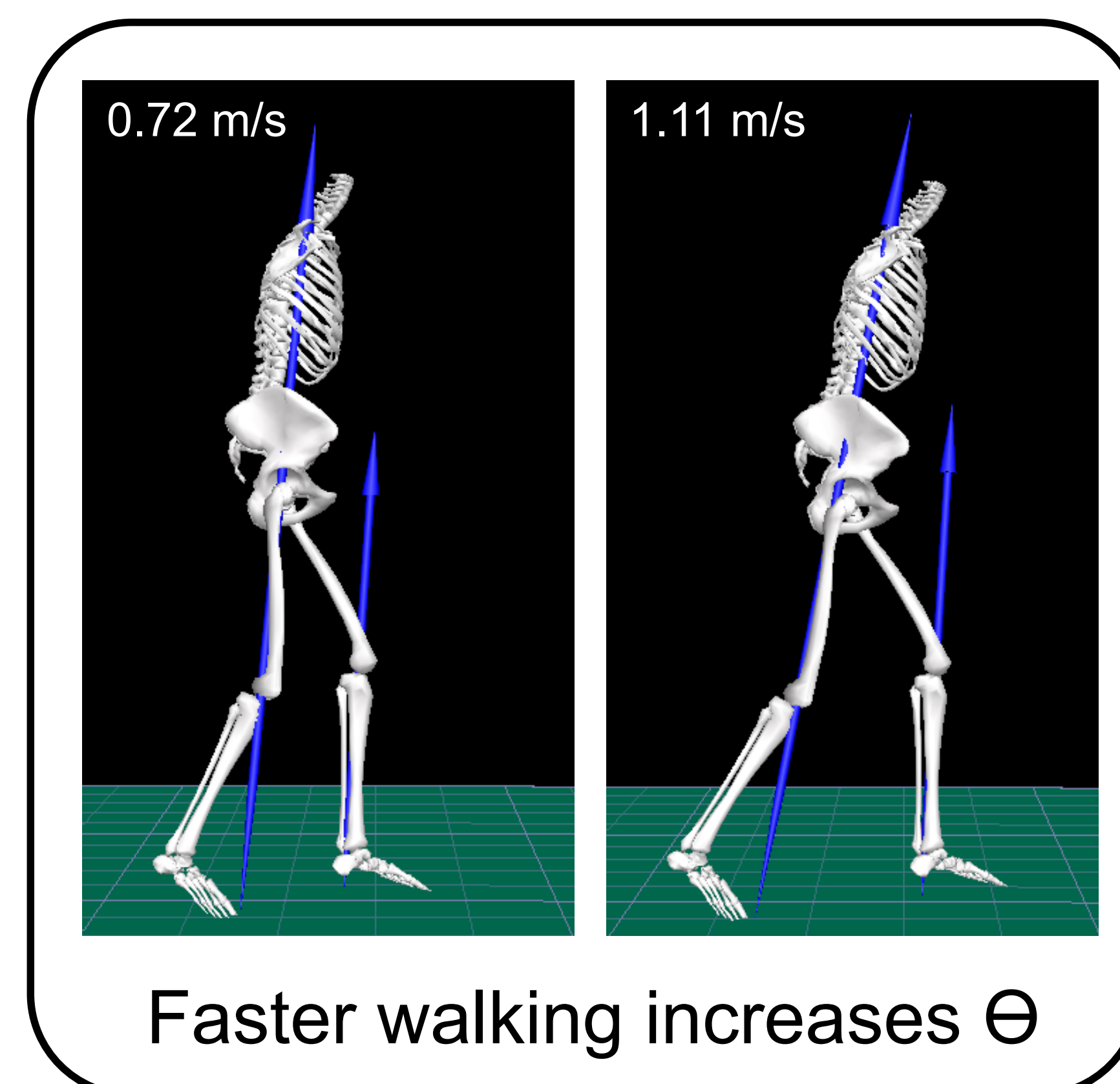


Key determinants of paretic limb forward propulsion (AGRF) are the:

- 1) posterior positioning of the limb behind the body: Θ
- 2) ankle plantarflexion torque: M_{PF}

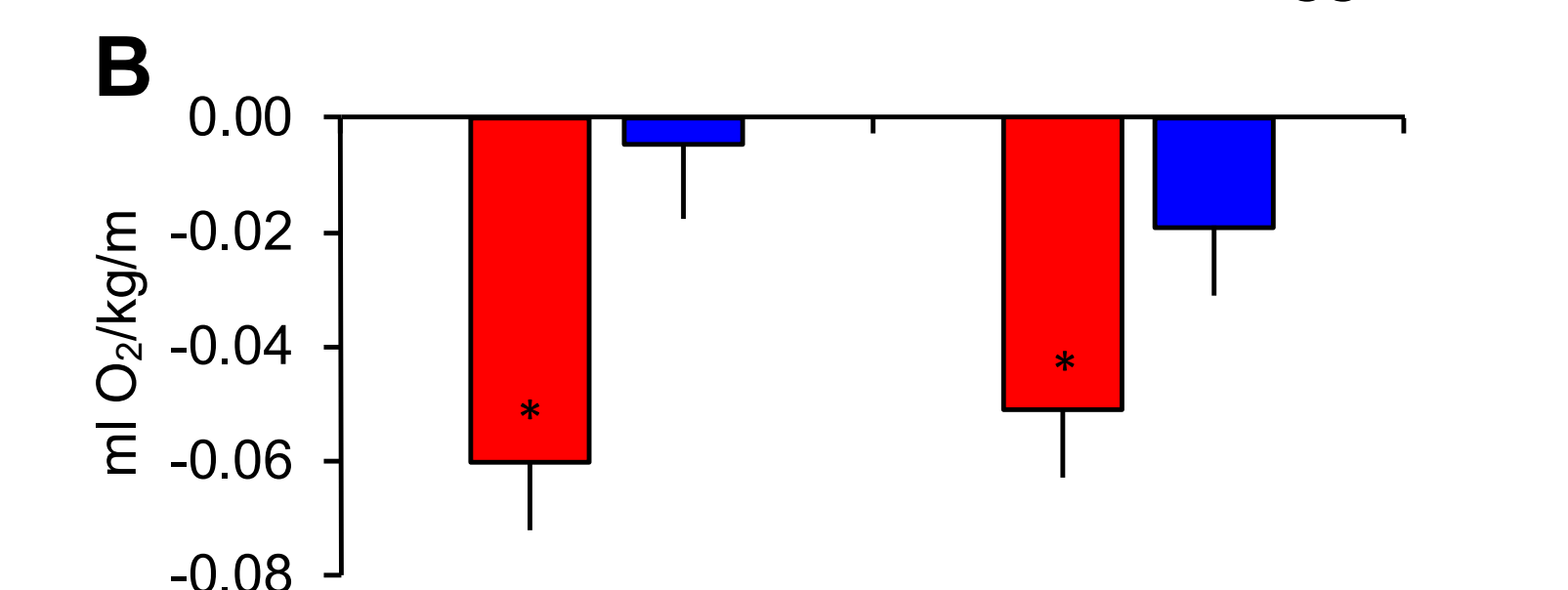
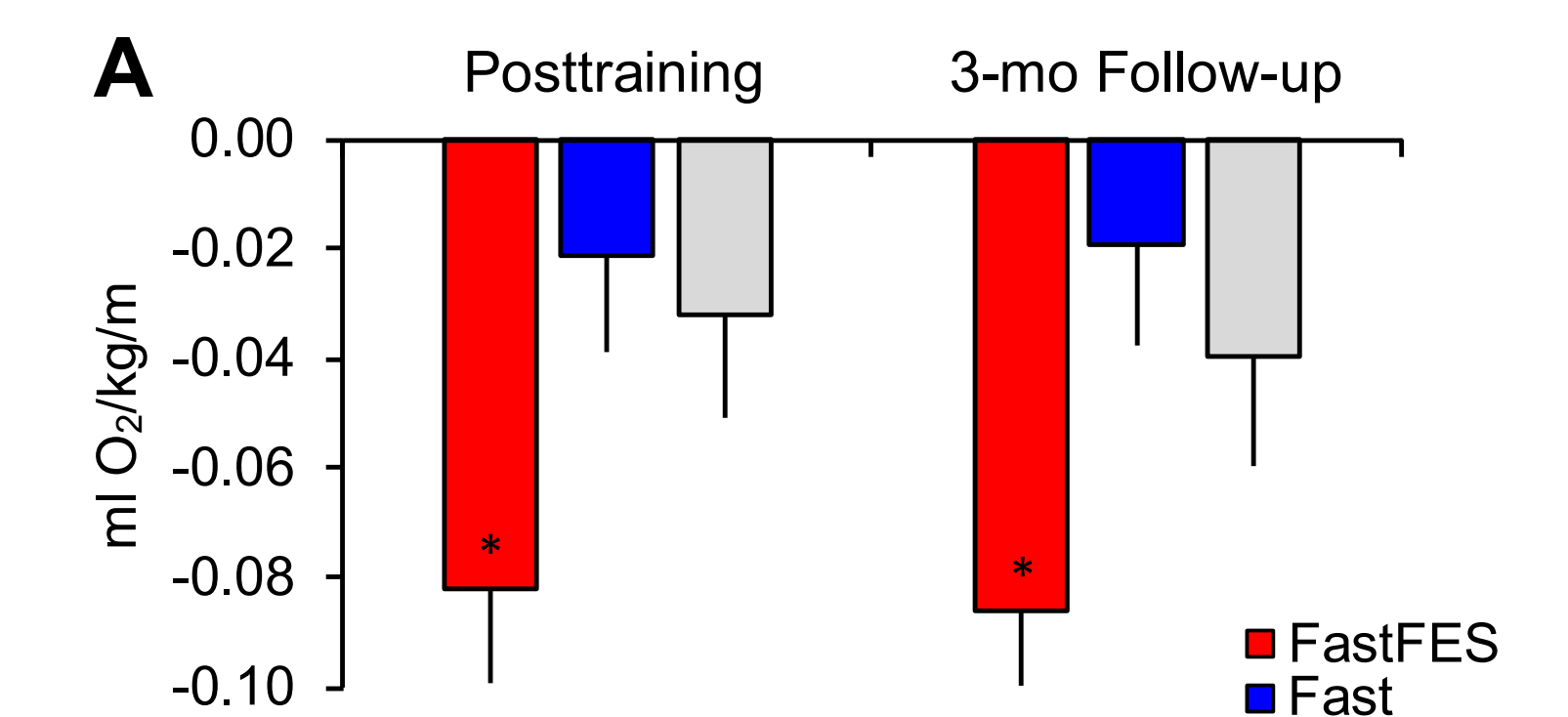
FastFES: A Hypothesis-Driven Combination Therapy

The FastFES Intervention: A 12-week, 36-session rehabilitation program that combines fast locomotor training with plantarflexor functional electrical stimulation (FES) to target deficits in paretic propulsion during gait retraining.

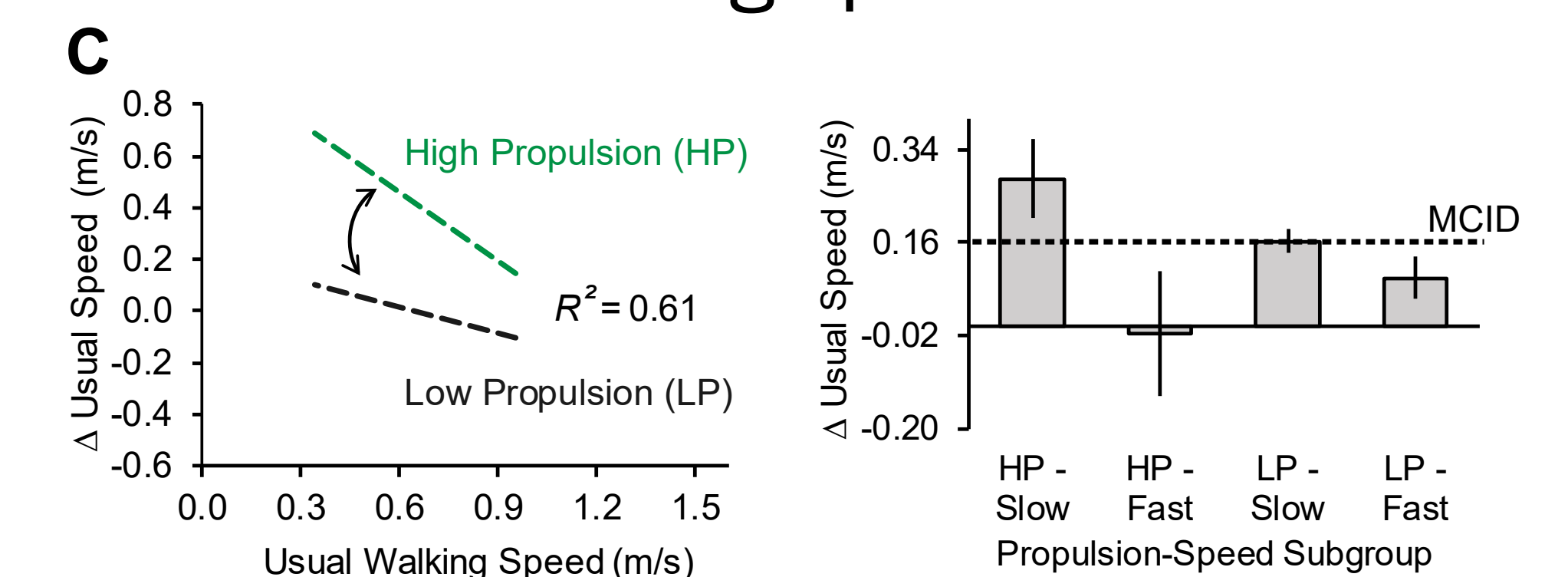


The FastFES Hypothesis: Targeting deficits in paretic propulsion during gait training will restore more physiological gait patterns and reduce the high energy cost of transport characteristic of poststroke hemiparesis.

The Evidence



Only FastFES training was effective in reducing participants' energy cost of walking at each comfortable (A) and fast (B) walking speeds.



All 3 gait programs comparably improved walking function; however, prognostic analyses (C) demonstrate that FastFES' effects on walking function are markedly enhanced in slow walkers with higher levels of paretic propulsion.

Conclusions

- The FastFES gait intervention is effective at reducing the high energy cost of walking typical after stroke
- Better identification of the best candidates for this targeted gait therapy is needed
- Evaluation in the earlier phases poststroke is warranted

Acknowledgements

This work was completed at the University of Delaware and supported by NIH Grants: R01NR010786, T32HD007490, K01HD050582

Key References

- Reisman et al. 2009. Influence of speed on walking economy poststroke
 Hsiao et al. 2015. Mechanisms to increase propulsive force poststroke
 Awad et al. 2016. Reducing the cost of transport and increasing distance poststroke
 Awad et al. 2016. Identifying candidates for targeted gait rehabilitation after stroke