Automaticity and motor learning: changes in spinal activity and cortical activation during split-belt adaptation

Chase G. Rock[1,2], Shuqi Liu[1,2], Nathan W. Brantly[1,2], Douglas J. Weber[3], Aiko K. Thompson[6], Hartmut Geyer[4,5], Gelsy Torres-Oviedo[1,2]

[1]Department of Bioengineering, University of Pittsburgh; [2]Center for the Neural Basis of Cognition;
[3]Neuroscience Institute, [4]Department of Mechanical Engineering, [5]Robotics Institute, Carnegie Mellon University
[6]Department of Health Sciences and Research, Medical University of South Carolina

chasegrock.com

chase.rock@pitt.edu

Hypothesis

Automaticity is linked to motor learning, such that a person's degree of automaticity increases as motor learning progresses.

Summary

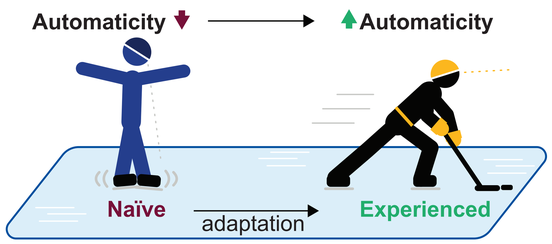
Motor learning involves a shift from high to low attentional control, or **automaticity.** (1)(2)

Gap: the neural determinants of automaticity have not been comprehensively assessed during motor learning.

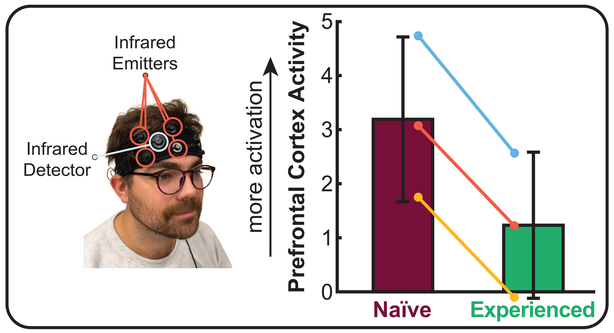
Attentional control can be indirectly measured through activation of the prefrontal cortex via fNIRS. (3)

In gait, automaticity is achieved through neural circuits in the spine, assessed via H-reflex. (4)

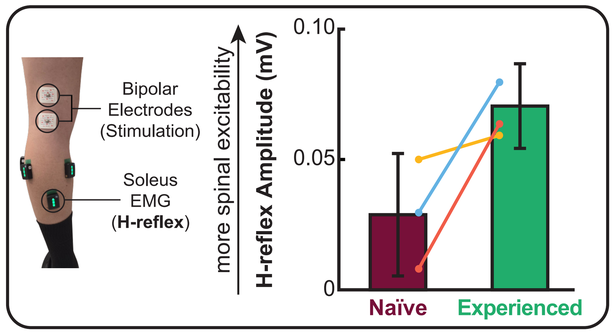
Prediction



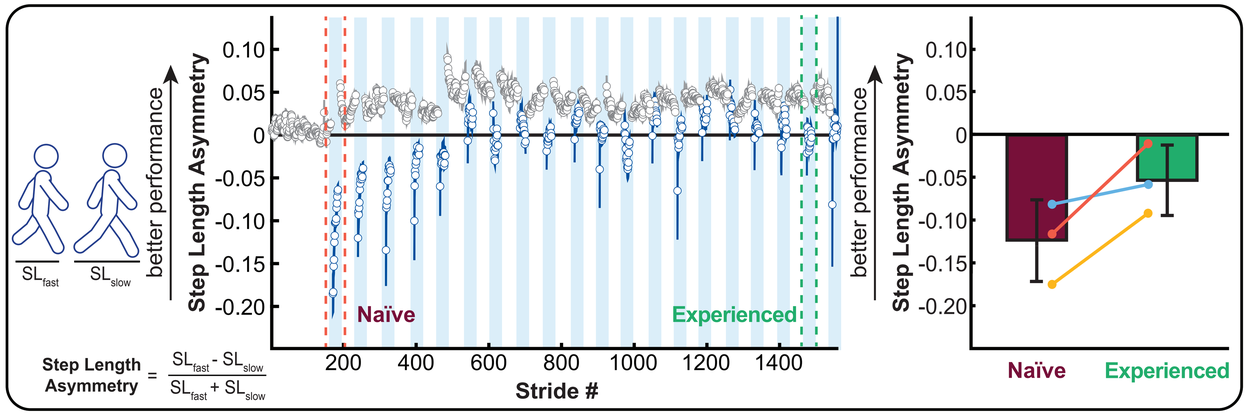
Prefrontal cortex activity is initially increased and then is suppressed with adaptation



H-reflex is initially suppressed in split-belt walking and then increases with adaptation

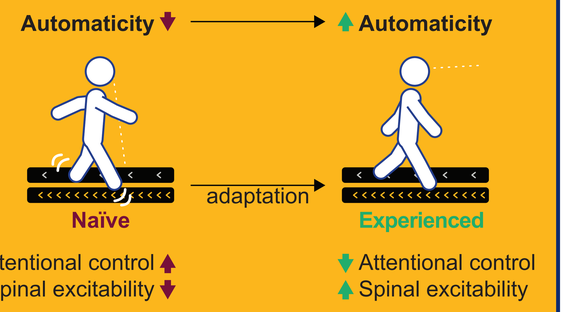


Step length asymmetry in split-belt walking is reduced with adaptation



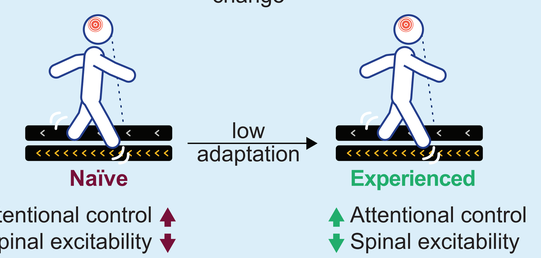
Conclusion

In support of our hypothesis, spinal and supraspinal activity reflected an increase in automaticity as motor learning progressed.



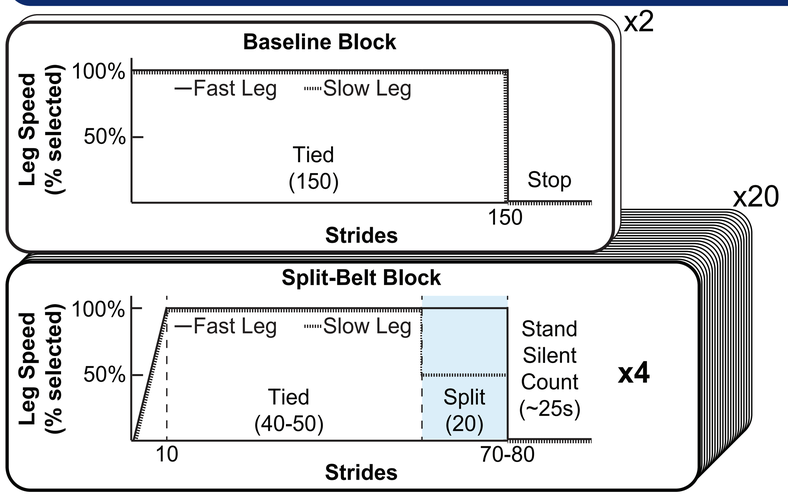
Ongoing Work

Does the heterogeneity in post-stroke rehabilitation outcomes stem from altered automaticity?

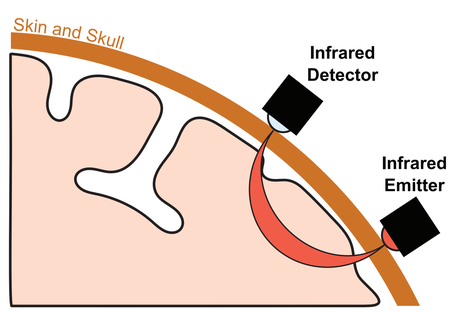


Hypothesis: Reduced motor learning coincides with reduced change in automaticity during adaptation.

Procedure (n = 3)

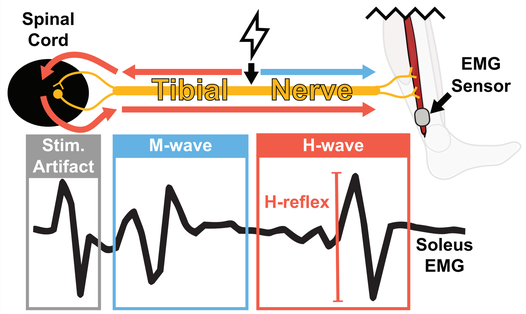


Prefrontal Cortex Activity



Increased cortical activity ➔ More light absorbed

Spinal Excitability



Higher spinal excitability ➔ Larger H-reflex amplitude

Acknowledgements

Funding for this work was provided by NINDS T32 NS086749 & NSF 2419849. Conference attendance was supported by the Society for Neuroscience Trainee Professional Development Award.

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