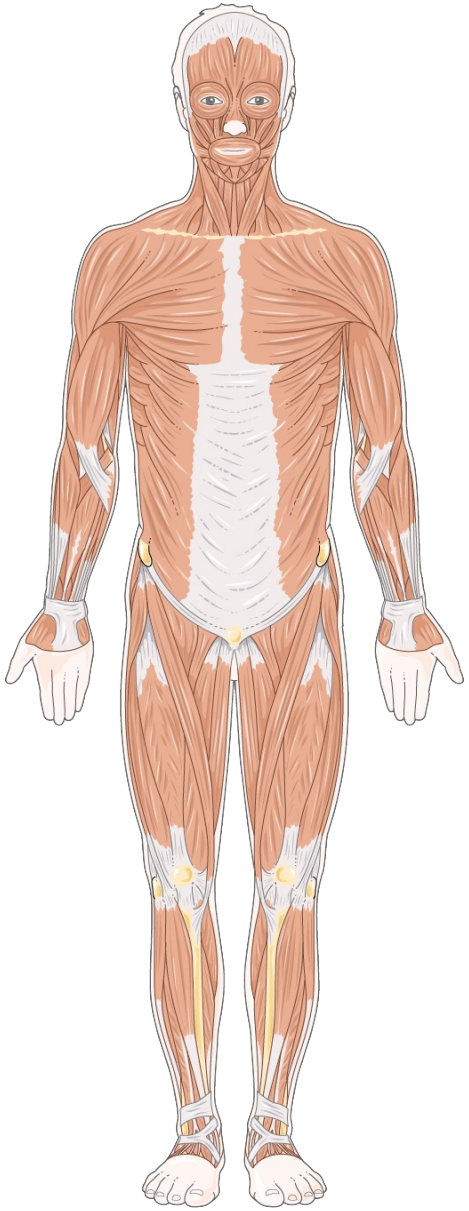
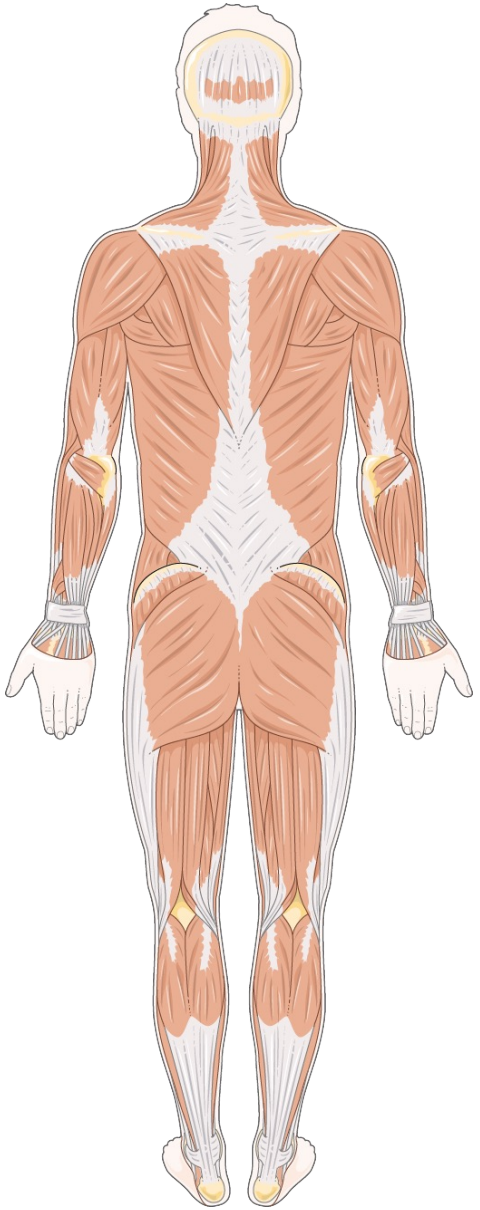


Eccentric Exercise Combined with Aquatic Plyometric Exercise on Muscle Function Measures



Cassidy Weeks
Mentor: Dr. Brennan Thompson

Research Question

Does combining eccentric overload training with aquatic plyometrics increase muscular strength alongside SSC performance?

Eccentric Muscle Contraction

Active muscle lengthening used to resist force

- Lowering phase of lift, deceleration of sprint

SSC

- Stretch shortening cycle
- “Pre-stretch” used in human movement (particularly jumping and sprinting) that allows more force to be developed faster
- Uses eccentric & concentric action

Why eccentric overload exercise & aquatic plyometrics?

- Load heavy
- Energy & time efficient
- Superior muscle strength gains

- High speed, explosive
- Gold standard for training SSC
- Mitigate possible soreness & risk of injury

Desirable for populations that may not tolerate traditional resistance training or plyometrics

Previous Research

- Once or twice weekly, 5-minute Eccentron training showed significantly increased muscular strength after only 4 weeks (1,2)
- Eccentron training did not transfer to SSC improvements (1,2)

Previous Research

- Land-based plyometrics vs. aquatic-based plyometrics
  - Similar sig. increases in SSC measures [3] with less soreness in aquatic group
- Plyometrics shown more effective when paired with resistance training [4]

Methods

Participants

- 18-35 years old, recreationally active
- Matched for gender and baseline eccentric strength

Protocol

- Pre/posttest
- Randomized into eccentric only or eccentric + aquatic group

Training

<u>Eccentric-Only</u>

- Once weekly training
- 5-minute workout
- Each week increasing load

<u>Eccentric + Aquatic</u>

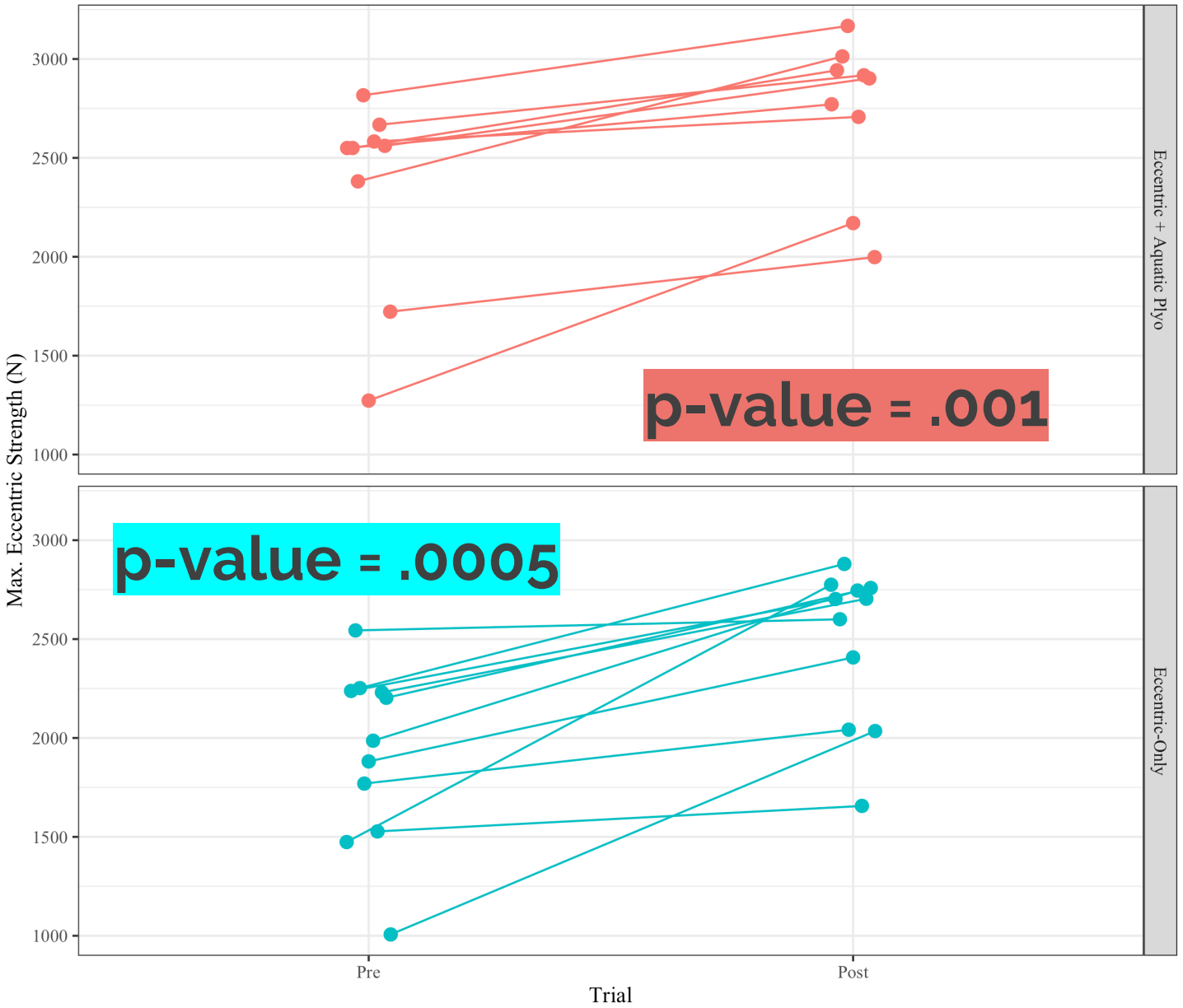
- Same Eccentron training
- Added once weekly plyometric training in pool

TRAINING WEEK	TRAINING VOLUME	PLYOMETRIC DRILL	SETS X REPS	TRAINING INTENSITY
1	84	Double leg hops	2 x 9	Low
		Side to side hops	2 x 9	Low
		Tuck jump	2 x 8	Med
		Alternating split squats	2 x 8	Med
		Countermovement jump	2 x 8	Med

Outcome Measures

- Depth jump height
- Maximal eccentric strength
- Isometric peak force

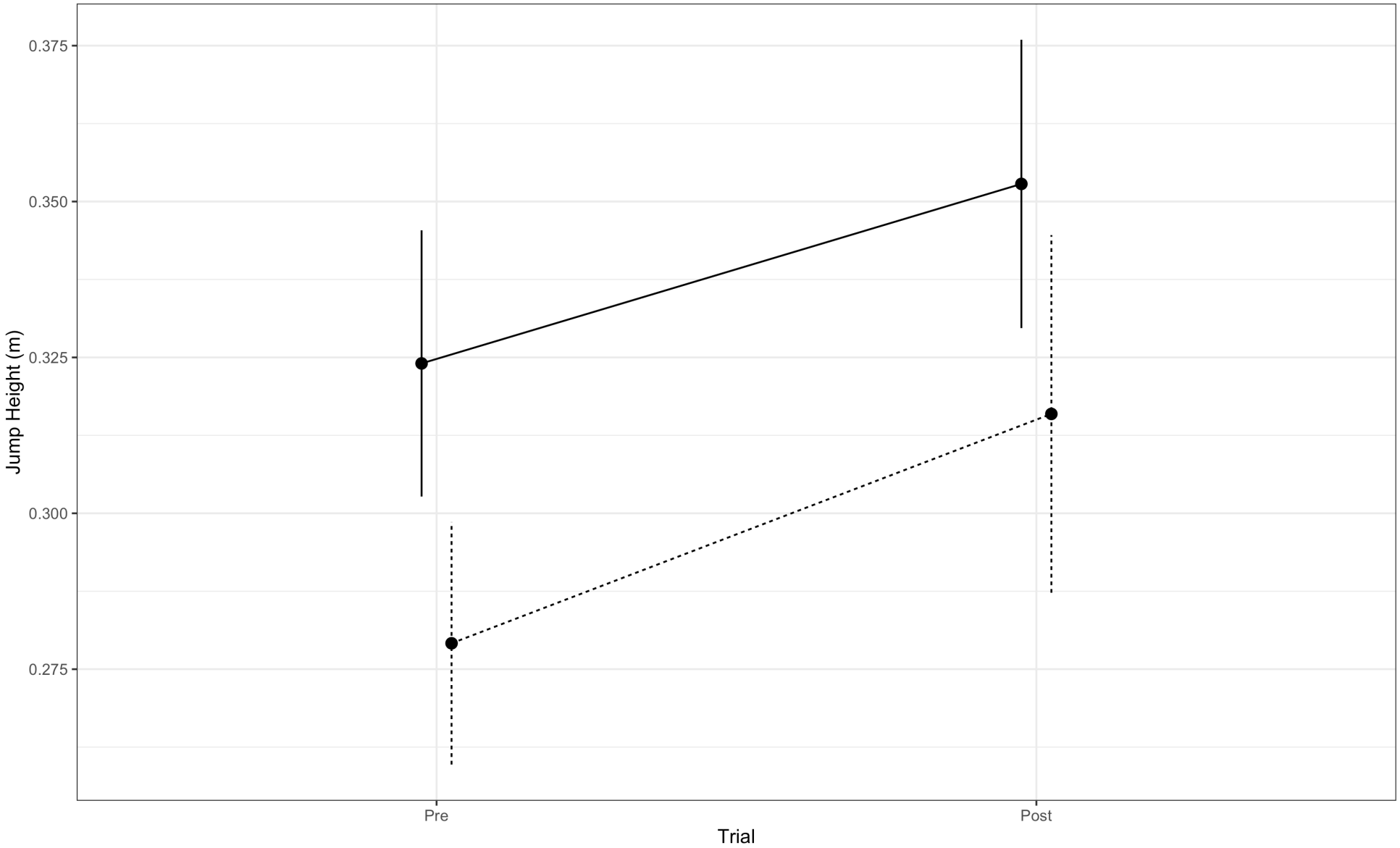
RESULTS: eccentric strength



No significant difference between groups (p = .08)

Cohen's d = 1.08

RESULTS: depth jump

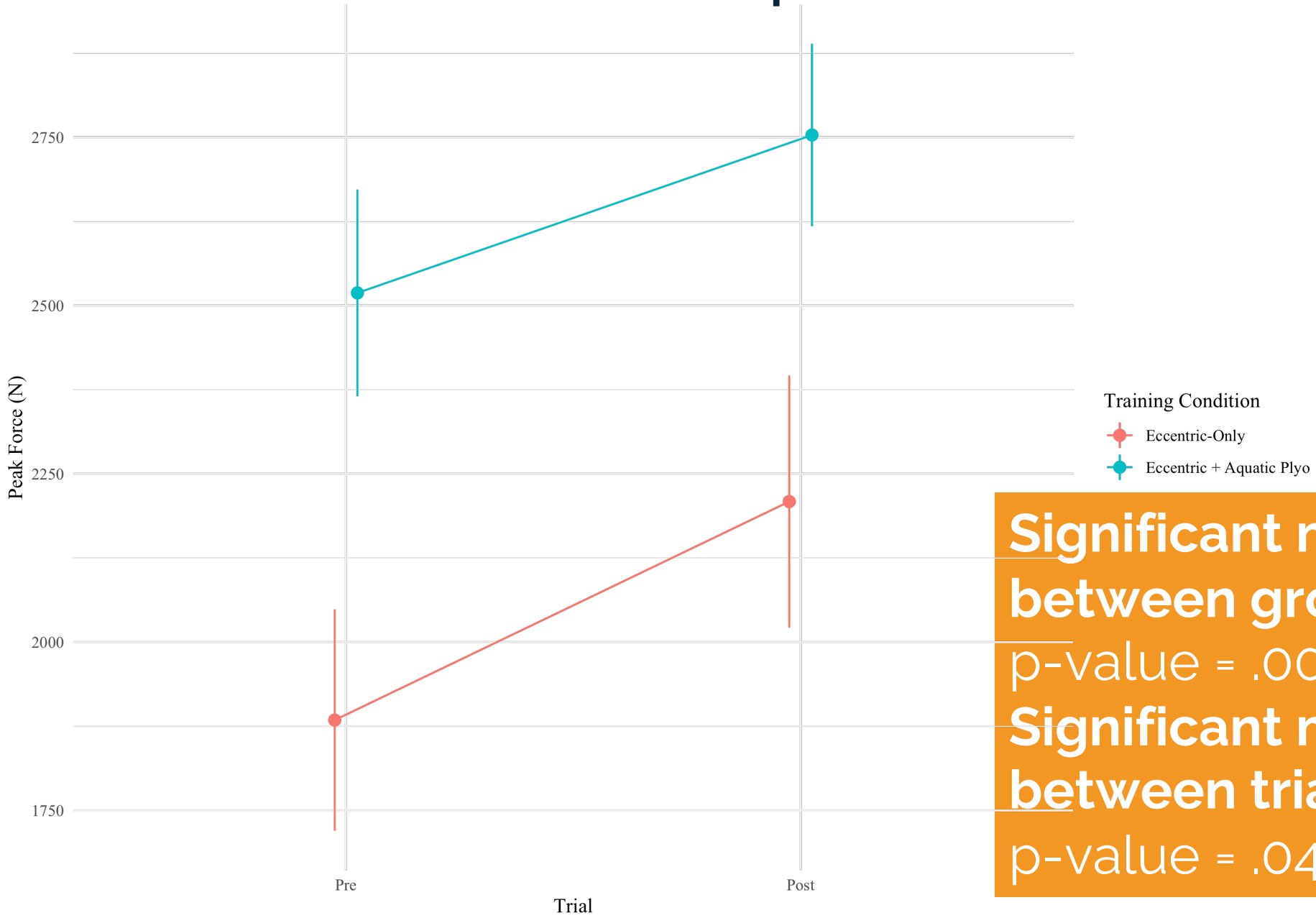


Significant main effect for trial

p-value = .001

No significant difference between groups (p = .2)

RESULTS: isometric peak force



Significant main effect between groups
p-value = .004
Significant main effect between trials
p-value = .04

Conclusion

- Aquatic plyometric training may not inhibit strength gains when performed concurrently with eccentric overload training
- Training eccentric portion of SSC may be most important for jump height improvement

Combining eccentric overload training with aquatic plyometric training may increase muscular strength and SSC performance but not more than eccentric training alone.

Contact Information

Cassidy Weeks
cassidy.weeks@usu.edu

Principal Investigator
Dr. Brennan Thompson
brennan.thompson@usu.edu

References

1. Crane, J. S., Thompson, B. J., Harrell, D. C., Bressel, E., & Heath, E. M. (2020). Comparison of high versus low eccentric-based resistance training frequencies on short-term muscle function adaptations. *Journal of Strength and Conditioning Research*, *Publish Ahead of Print*. https://doi.org/10.1519/JSC.0000000000003482

2. Gordon, J. P., Thompson, B. J., Crane, J. S., Bressel, E., & Wagner, D. R. (2019). Effects of isokinetic eccentric versus traditional lower body resistance training on muscle function: Examining a multiple-joint short-term training model. *Applied Physiology, Nutrition, and Metabolism*, *44*(2), 118–126. https://doi.org/10.1139/apnm-2018-0333

3. Robinson, L. E., Devor, S. T., Merrick, M. A., & Buckworth, J. (2004). The effects of land vs. aquatic plyometrics on power, torque, velocity, and muscle soreness in women. Journal of Strength and Conditioning Research, 18(1), 84-91. https://doi.org/10.1519/1533-4287(2004)018<0084:teolva>2.0.co;2

4. Fatouros, I. G., Jamurtas, A. Z., Leontsini, D., Taxildaris, K., Aggelousis, N., Kostopoulos, N., & Buckenmeyer, P. (2000). Evaluation of plyometric exercise training, weight training, and their combination on vertical jumping performance and leg strength. Journal of Strength and Conditioning Research, 14(4), 470–476. https://doi.org/10.1519/00124278-200011000-00016