

Acute and Chronic Effects of Post-Activation Potentiation (PAP) with Plyometric Training on Vertical Jump Height in Division I Female Athletes

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INTRODUCTION

Complex training is a strength-based exercise followed by a fast and powerful movement that is biomechanically of similar nature to the strength exercise (Gołaś et al. 2016). One of the many reasons why this method of training is thought to be successful is due to the Post-Activation Potentiation (PAP) response elicited from the strength-based exercise which notably results in improved speed and power output (Constantinos Tsimachidis et al. 2013; Gołaś et al. 2016). Prior research has predominantly targeted male populations using a heavy compound movement and long rest intervals as a PAP stimulus. Our study focused on female athletic populations and plyometric movements with short rest intervals as a PAP stimulus.

PURPOSE & HYPOTHESES

Purpose: Investigate the PAP effects in assisted and resistance based pogo jumps* in Division I female athletes vertical jump heights; with the objective of examining the chronic and acute differences in vertical jump height.

Hypothesis: A PAP stimulus of a loaded or assisted plyometric exercise for female athletes will elicit greater acute vertical jump heights when comparing pre-plyo and post-plyo measurements.

*Continuous and stationary vertical jumping that primarily uses the ankle joint and little knee or hip flexion.

PROJECT DESIGN

- Counterbalanced Trial
- 5-10 minute warm-up
- Pre- and Post-plyo, and Baseline and Post-research vertical jump measurements were recorded using a Just Jump System (inches)
- Assisted (TRX Strap), Bodyweight, and Resisted (10 lb dumbbells) Pogo Jumps – 1 x 10 reps
- Forty-five second rest interval
- Post-plyo vertical jump testing



Figure 1. Vertical Jump Testing



Figure 2. Assisted Pogo Jumps



Figure 3. Bodyweight Pogo Jumps

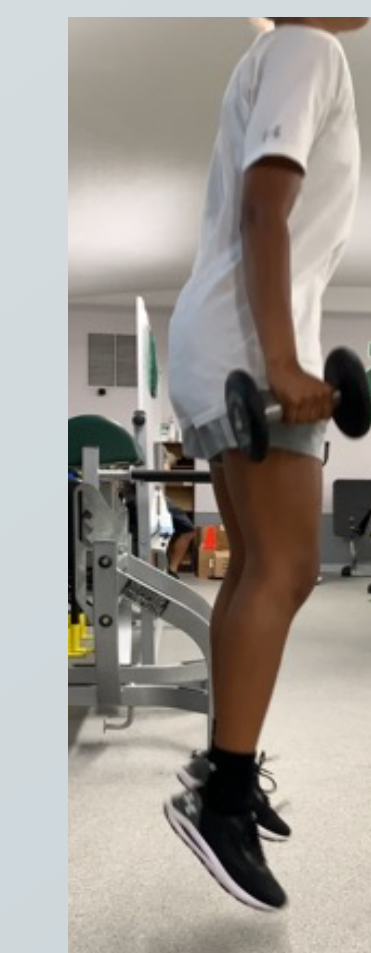


Figure 4. Resisted Pogo Jumps

CONCLUSION

Although it was inconclusive, trends favored the resisted plyometric methodology to elicit the greatest PAP response in comparison to the assisted and bodyweight plyometric stimulus.

FUTURE RESEARCH

Investigating for an optimal rest time specific to plyometrics being used as a PAP stimulus
Alternative assisted intervention (e.g. resistance band)
Examine different plyometric modalities (e.g. box jumps, bounding, sprinting etc.) - pogo jumps may not be the best movement to elicit a PAP response in vertical jump height
Use varying resisted plyometric exercises to elicit PAP responses

RESULTS

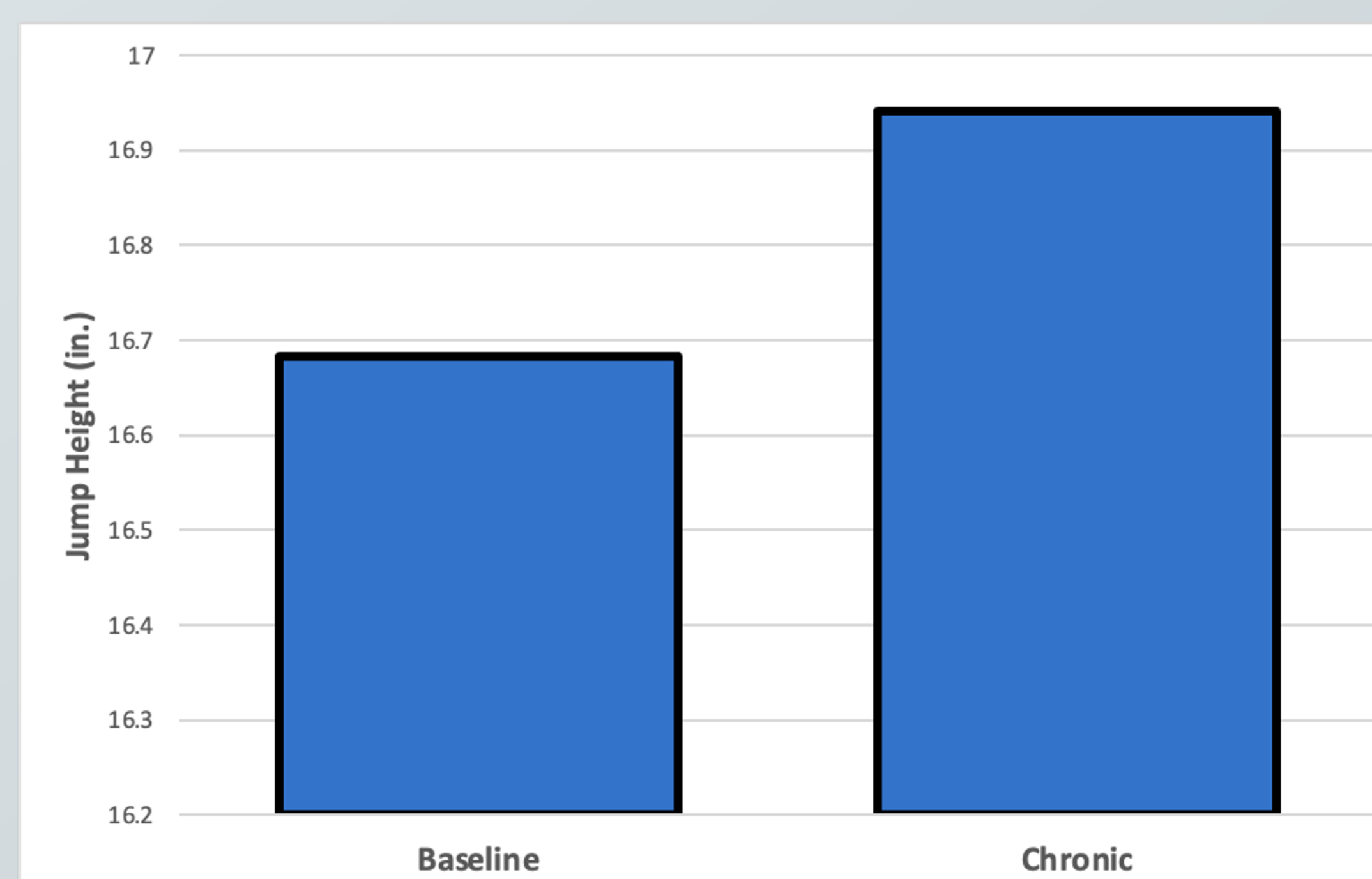


Figure 5. Baseline and Chronic Means of Jump Height in inches (in.)

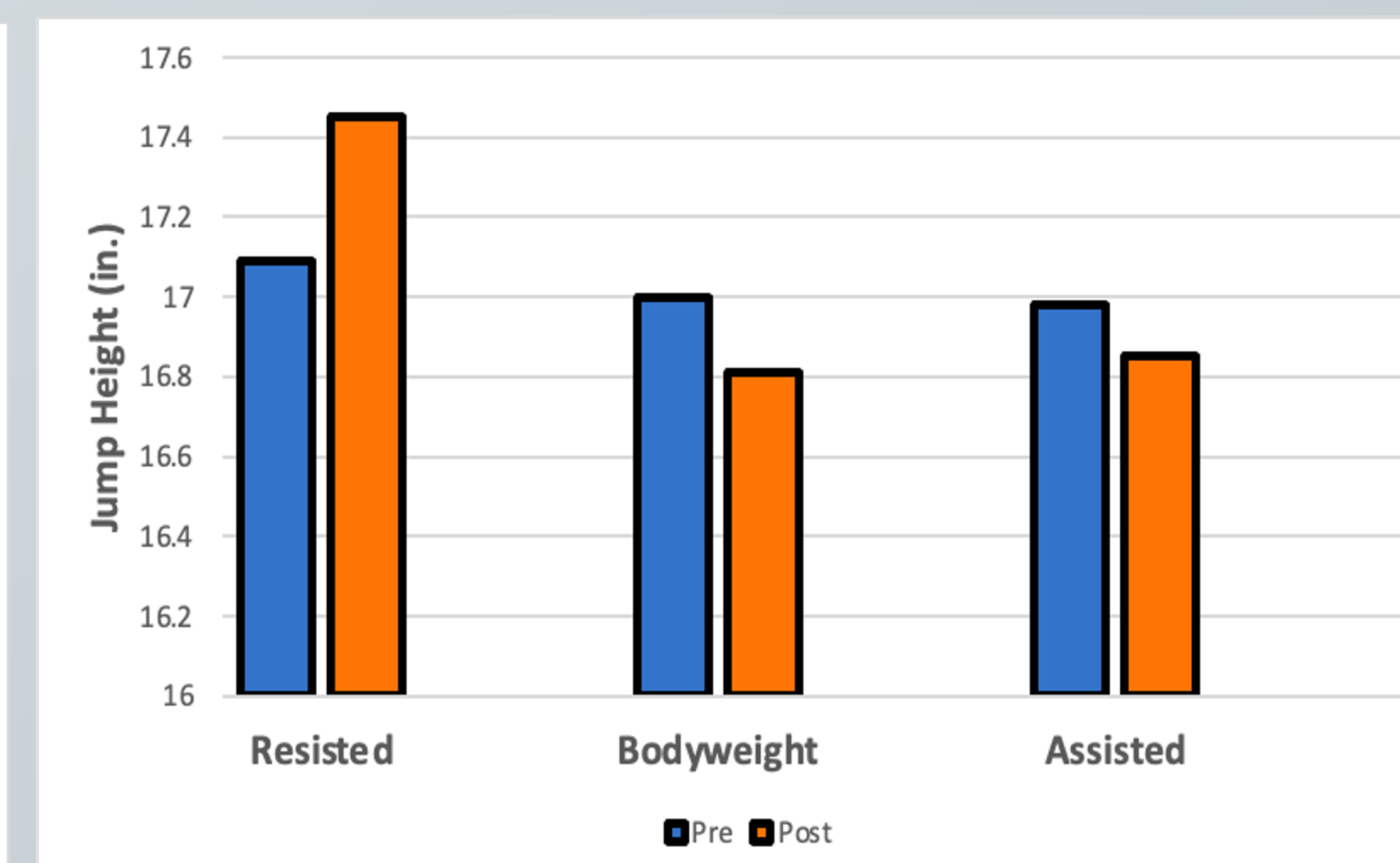


Figure 6. Pre- and Post-Plyometric Means of Jump Height in inches (in.) of Resisted, Bodyweight and Assisted Pogo Jumps

The dependent t-test of the differences in the means revealed nonsignificant findings between the baseline and chronic vertical jump heights (16.6833 ± 2.25946 Baseline vs 16.9417 ± 2.17943 Chronic; $t = 0.657$, $p = 0.262$).

A one-way ANOVA was performed to compare the effect of the resisted, bodyweight, and assisted pogo jump interventions on vertical jump height. A one-way ANOVA demonstrated that there wasn't a statistically significant difference between the three groups ($F(\text{Between Groups}) = 0.210$; $p = 0.811$).

PRACTICAL APPLICATIONS

Coaches and trainers may use a variety of methods to prepare athletes and clients for explosive tasks. Due to none of the interventions here significantly improving upon baseline performance, the role of existing general dynamic warm-up protocols can not be overlooked. Where specific, brief preparatory protocols are sought, existing research and practice still seem to favor resisted actions. Additional research is warranted.