

Howe, Louis, Coward, Martyn and Price, Phil (2017) The postactivation potentiation effect of either plyometrics or speed, agility and quickness exercises on linear sprint performance. In: UK Strength and Conditioning Association (UKSCA) Annual Conference, 4-6 August 2017, Hinckley, UK. (Unpublished)

Downloaded from: <http://insight.cumbria.ac.uk/id/eprint/3455/>

*Usage of any items from the University of Cumbria's institutional repository 'Insight' must conform to the following fair usage guidelines.*

Any item and its associated metadata held in the University of Cumbria's institutional repository Insight (unless stated otherwise on the metadata record) may be copied, displayed or performed, and stored in line with the JISC fair dealing guidelines (available [here](#)) for educational and not-for-profit activities

**provided that**

- the authors, title and full bibliographic details of the item are cited clearly when any part of the work is referred to verbally or in the written form
- a hyperlink/URL to the original Insight record of that item is included in any citations of the work
- the content is not changed in any way
- all files required for usage of the item are kept together with the main item file.

**You may not**

- sell any part of an item
- refer to any part of an item without citation
- amend any item or contextualise it in a way that will impugn the creator's reputation
- remove or alter the copyright statement on an item.

The full policy can be found [here](#).

Alternatively contact the University of Cumbria Repository Editor by emailing [insight@cumbria.ac.uk](mailto:insight@cumbria.ac.uk).

# The Postactivation Potentiation Effect of Either Plyometrics or Speed, Agility and Quickness Exercises on Linear Sprint Performance

Louis Howe<sup>1</sup>, Martyn Coward<sup>1</sup>, Phil Price<sup>2</sup>

1. Department of Medical and Sport Science, University of Cumbria, Lancaster, UK.  
2. School of Sport, Health, and Applied Science, St Mary's University, Twickenham, UK.  
Corresponding author: Louis Howe - [louis.howe@cumbria.ac.uk](mailto:louis.howe@cumbria.ac.uk)

## INTRODUCTION

Postactivation potentiation (PAP) is a phenomenon whereby the contractile history of the muscle positively impacts the force generation capacity of an athlete for subsequent activities.<sup>1</sup> Traditionally, PAP protocols involve heavy resistance exercises that may not be applicable for all athletes due to logistical considerations. As such, warm-up routines incorporating plyometric exercises have previously been shown to result in a PAP response during athletic activities.<sup>3</sup> Other techniques such as speed, quickness and agility (SAQ) drills have not yet been identified as a viable warm-up tool that may potentiate performance.

### AIM:

The purpose of this study was to explore the acute benefits of including either a plyometric or SAQ based warm-up, on linear sprint speed.

## METHODS

Using a randomised repeated measures design, 16 (13 men, 3 women) recreationally trained athletes performed either a control (C), control and plyometric (P) or control and SAQ (SAQ) warm-up (table 1). The P and SAQ warm-ups were matched for total foot contacts. Following a four-minute recovery, subjects then performed three 10-metre linear sprints, recorded using the Smartspeed system (Fusion Sport, Coopers Plains, QLD, Australia). The fastest time (s) from each condition was used for statistical analysis. Testing sessions were separated by 48-hours. Ethical approval for this project was granted by the University of Cumbria ethics committee.

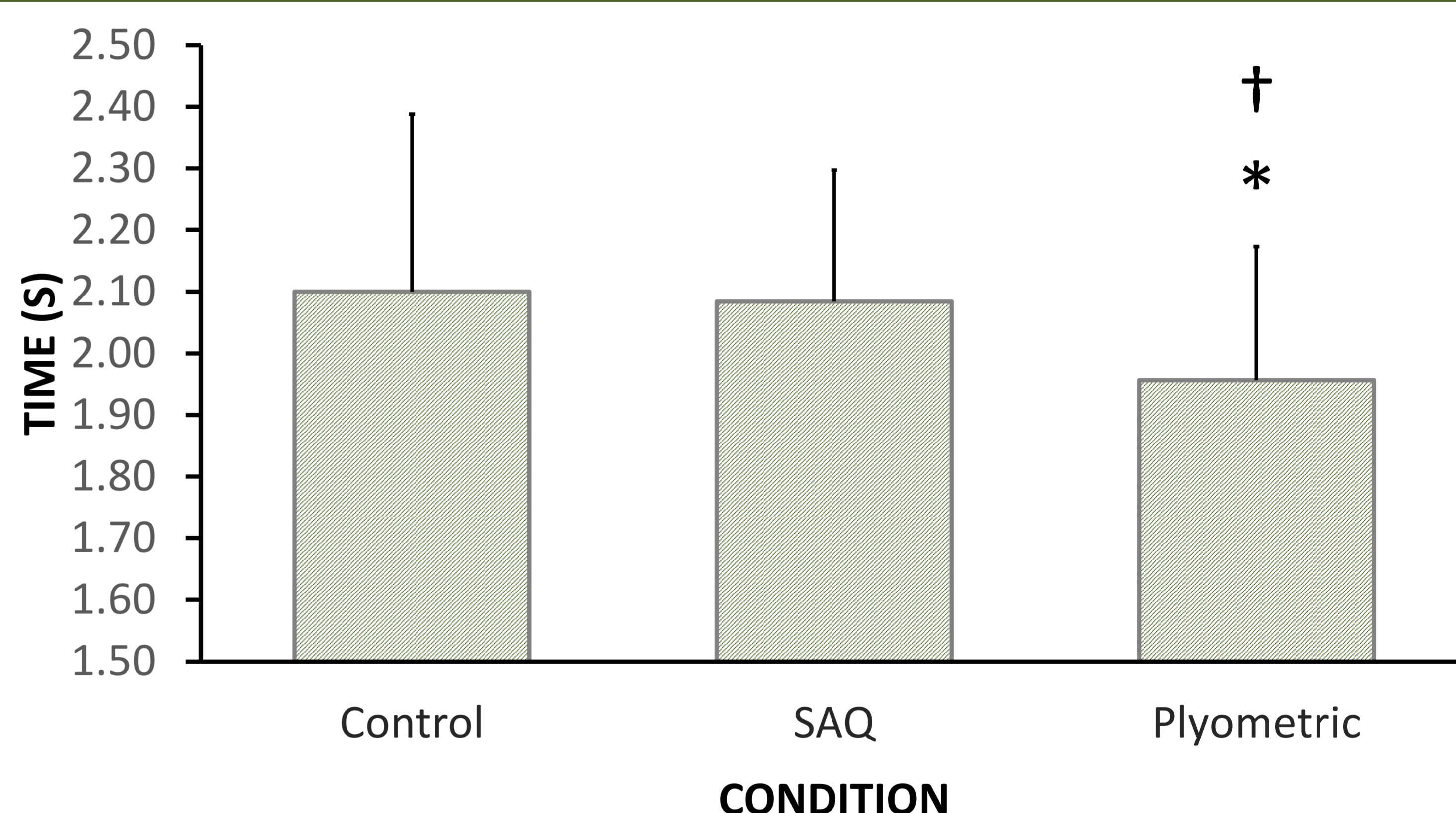
### EXERCISES

| Control    | 1. Linear jogging x20 metres        | 5. Lateral lunges x8 each side                       |
|------------|-------------------------------------|--|
|            | 2. Side shuffling x20 metres        | 6. Leg swings x20 each side                          |
|            | 3. Backward running x20metres       | 7. 10-metre sprints at 50, 75 and 90% maximal effort |
|            | 4. Forward lunge x8 each side       |  |
| Plyometric | 1. Hurdle hops x6 each leg          | 5. Drop jumps (20cm) x 10                            |
|            | 2. Lateral hurdle hops x10 each leg | 6. Broad jumps x5                                    |
|            | 3. Countermovement jumps x5         |  |
| SAQ        | 1. Forward in and out x10           | 4. Single leg linear hops x6 each leg                |
|            | 2. Slalom jumps x10                 |  |
|            | 3. Lateral scissor jump x10         |  |

**Table 1.** Exercises and repetitions for each condition. For both the plyometric and SAQ warm-ups, total foot contacts equalled 36 per foot.

## RESULTS

There was a statistically significant difference between groups for the 0-10m following a Friedman's ANOVA ( $\chi^2(2) = 25.125, p=0.00$ ). Post Hoc analysis using the Wilcoxon signed-rank test with a Bonferroni correction identified no significant difference between the control and SAQ conditions ( $Z = -0.906, p = 0.365, ES = 0.06$ ). However, there was significant improvements between conditions in favour of P; P vs. C ( $Z = -3.518, p < 0.001, ES = 0.50$ ) and P vs. SAQ ( $Z = -3.522, p < 0.001, ES = 0.44$ ).



**Figure 1.** Times for 10-metre linear sprints following each warm-up condition. \*Significantly different from control ( $p = 0.001$ ). † Significantly different from SAQ ( $p < 0.001$ ).

## SUMMARY AND CONCLUSIONS

As sprint performance is strongly determined by the amount of force an athlete can effectively produce<sup>2,4</sup>, a PAP response was not evident following the completion of the SAQ warm-up. Although not measured in this investigation, this is likely due to SAQ drills not requiring athletes to produce the high level of forces observed during plyometric exercises, therefore blunting the PAP response.

### KEY POINTS:

- Linear 10-metre sprint time is not acutely improved with the inclusion of Speed, Quickness and Agility drills as part of a dynamic warm-up.
- A warm-up consisting of plyometric exercises results in an acute decrease in 10-metre sprint times.

### REFERENCES

1. Lockie, R.G., Lazar, A., Davis, D.L. and Moreno, M.R., 2017. Effects of postactivation potentiation on linear and change-of-direction speed: analysis of the current literature and applications for the strength and conditioning coach. *Strength Cond J*. 2017. [Epub ahead of print].
2. Morin, J., Edouard, P. and Samozino, P. Technical ability of force application as a determinant factor of sprint performance. *Med Sci Sports Exerc* 43:1680 – 1688, 2011.
3. Turner, A.P., Bellhouse, S., Kilduff, L.P. and Russell, M. Postactivation potentiation of sprint acceleration performance using plyometric exercise. *J Strength Cond Res* 29:343 – 350, 2015.
4. Weyand, P., Sternlight, D., Bellizzi, M. and Wright, S. Faster top running speeds are achieved with greater ground forces not more rapid leg movements. *J Appl Physiol* 89:1991 – 1999, 2000.