

The Effect of Post Activation Potentiation Exercises (Depth-Jump vs. Countermovement Jumps) on Wingate Anaerobic Performance in Collegiate Athletes



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INTRODUCTION

- An effective warm-up to enhance anaerobic power is essential prior to a cycling event (1).
- Postactivation potentiation (PAP) is the change in characteristics of the skeletal muscle through force-time / -velocity which leads to an acute ↑ in muscular power and strength (2).
- Plyometric exercises like the depth jump (DJ) and countermovement jump (CMJ) are used as methods of inducing PAP (3).
- The aim of this study was to compare the PAP effect of DJs and CMJs on cycling sprinting ability in a Wingate anaerobic test (WAnT) (See Fig.1)

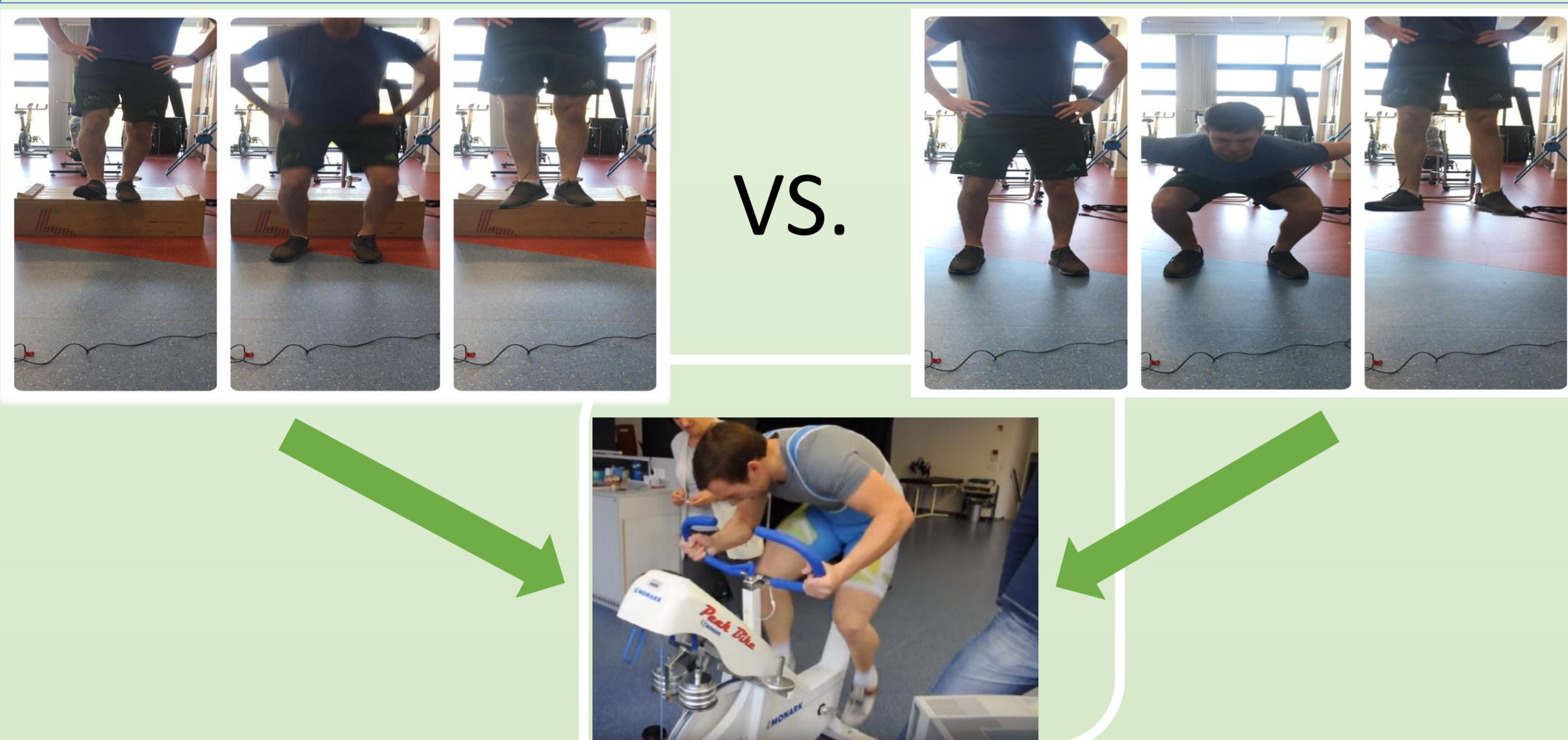


Fig 1. DJ vs CMJ on the control (WAnT)

MATERIALS & METHODS

- A randomised crossover trial was conducted on 21 participants (mean ± SD, age 21.6 ± 1.07 years, body mass 75.2 ± 11.89 kg, and height 176.5 ± 8.8 cm).
- A familiarisation session and three experimental protocols were carried out (control (CON), DJ and CMJ)
- Each participant performed a standardised 5-minute warm-up on the cycle ergometer (60-90rpm), followed by one of the three protocols (See Fig.2).
- Peak power output (PPO), relative peak power output (RPPO), anaerobic capacity (AC) and fatigue index (FI) were variables measured.
- Three independent repeated-measures ANOVAs with a Bonferroni post-hoc test were used on results obtained.
- Significance was set at P≤0.05.
- Microsoft Office Excel was used to calculate percentage differences and effect size using Cohen's d-test.

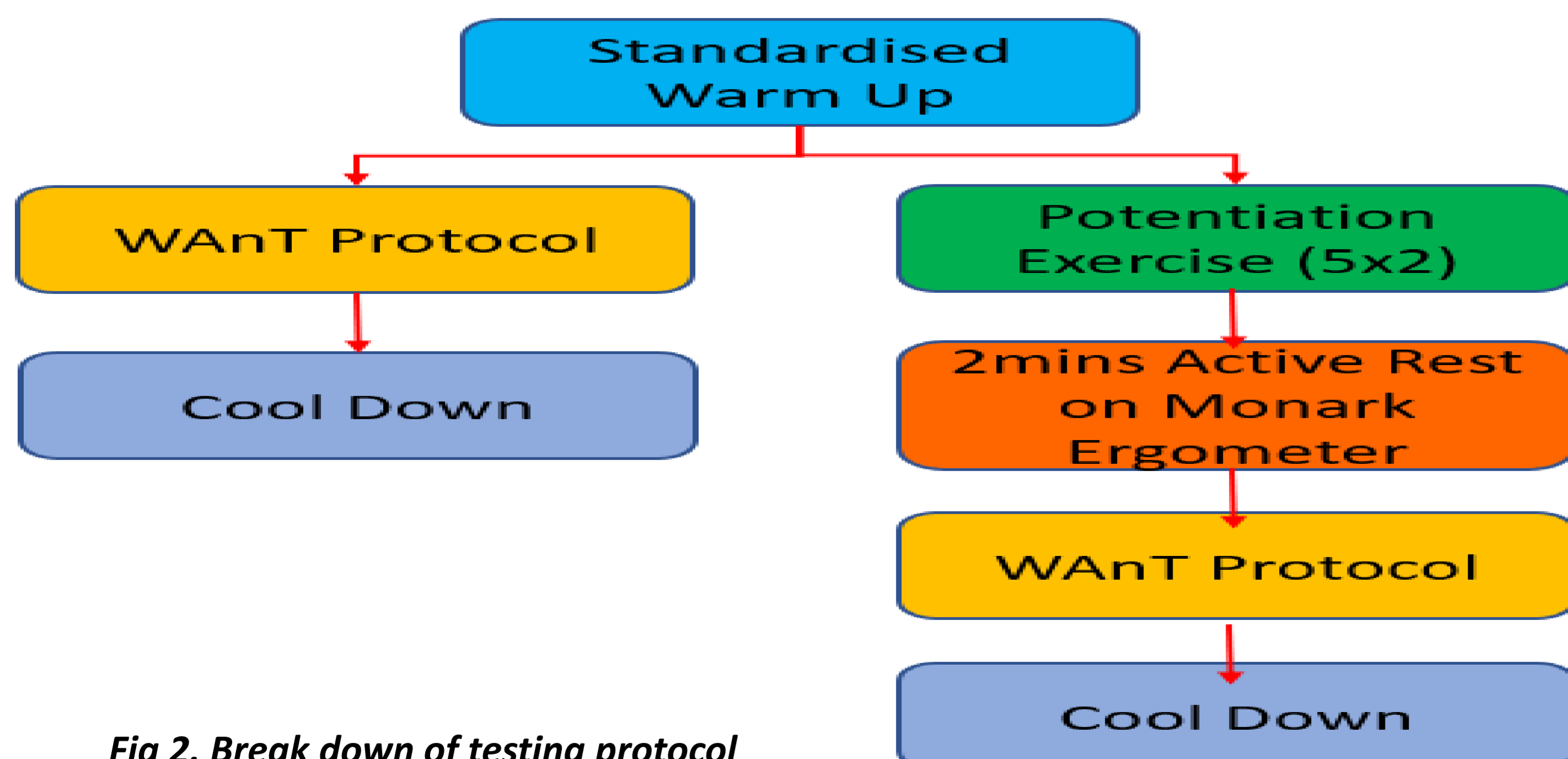


Fig 2. Break down of testing protocol

RESULTS

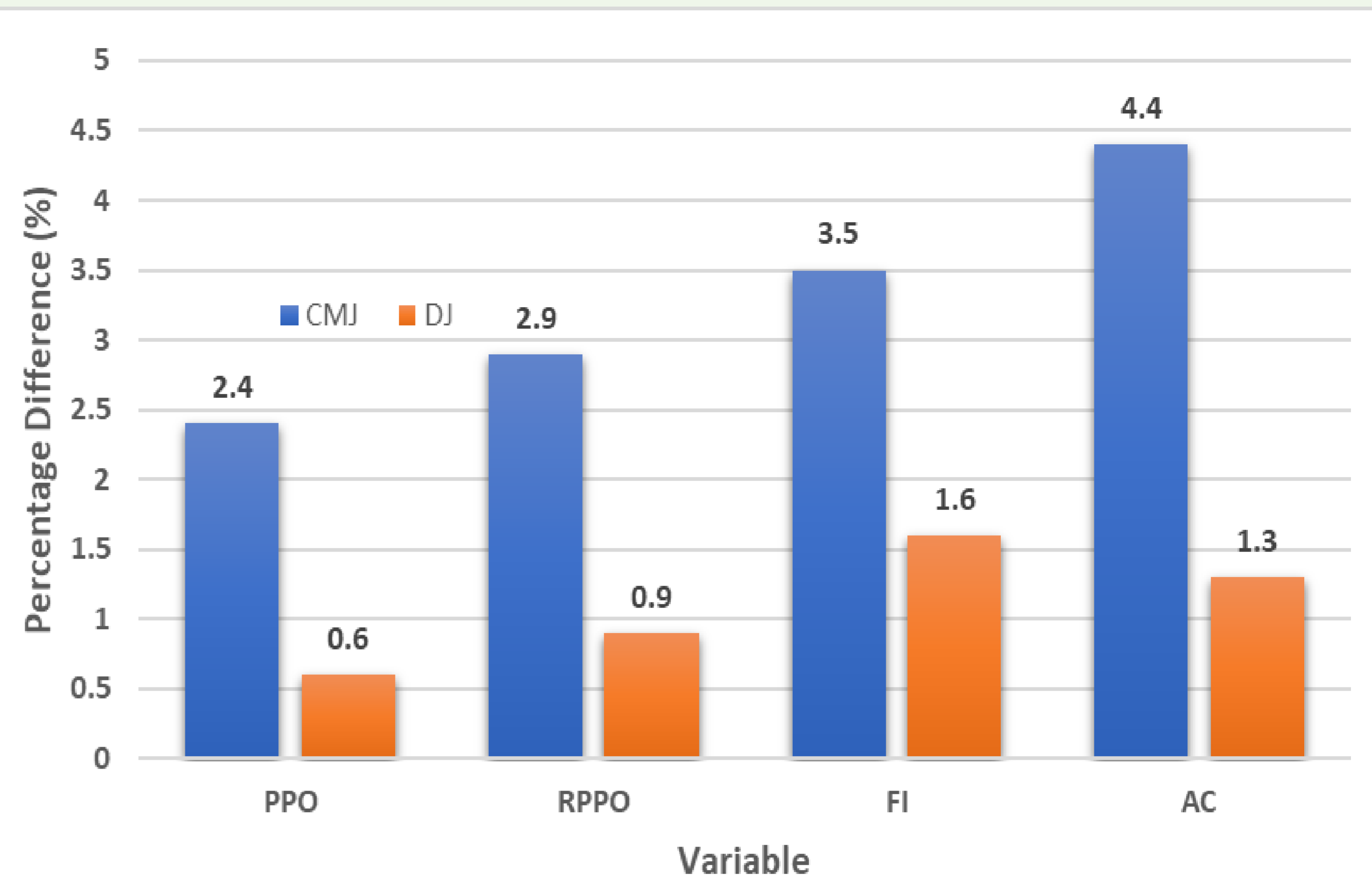


Fig 3. Percentage differences between experimental conditions vs CONT *Denotes significant difference (P ≤0.05)

Table 1. Comparison between PPO, RPPO, FI and AC for all testing procedures (Mean ± S.D)

	Peak Power Output (W)			Relative Peak Power (W/Kg)			Fatigue Index (%)			Anaerobic Capacity(W)		
	CMJ	DJ	CON	CMJ	DJ	CON	CMJ	DJ	CON	CMJ	DJ	CON
Mean	799.7	785.5	780.7	10.57	10.35	10.26	50.02	49.06	48.29	3528.3	3420.8	3375.2
±	±	±	±	±	±	±	±	±	±	±	±	±
S.D.	188.9	194.6	226.7	1.5	1.53	2.09	6.05	6.81	6.27	855.82	854.5	957.58

DISCUSSION

- Non-significant results were reported in this study (See Fig.3).
- Trivial ↑ were observed for both PAP conditions which can't be ignored as in anaerobic sports marginal increases can change an outcome (4).
- A number of factors could be related to why non-significant findings were observed.
 - A key observation from this study was the use of a standardized PAP protocol throughout.
 - PAP has been shown to affect individuals differently depending on their training status which impacts, the rest time and volume chosen (5; 2)

CONCLUSION

- DJs & CMJs as a PAP exercise can ↑ AC in WAnT.
- An unexpected finding was observed with the CMJ group producing a non significant but > PAP response than the DJ group.
- Despite the non-significant findings, the results should not be disregarded as even a trivial effect size difference has been shown to be a determining factor in elite level sprinting activities.
- Further research** is needed to extend these findings to elite level cyclist with the findings from this study providing coaches with a possible PAP protocol to ↑ sprint cycling ability.
- Individualisation of PAP protocols needs to be considered

References

- Martin, J.C., Davidson, C.J. and Pardyjak, E.R., 2007. Understanding sprint-cycling performance: the integration of muscle power, resistance, and modeling. *International journal of sports physiology and performance*, 2(1), pp.5-21.
- Tillin, N.A. and Bishop, D., 2009. Factors modulating post-activation potentiation and its effect on performance of subsequent explosive activities. *Sports medicine*, 39(2), pp.147-166.
- Newton, R.U. and Dugan, E., 2002. Application of strength diagnosis. *Strength & Conditioning Journal*, 24(5), pp.50-59.
- Drinkwater, E., 2008. Applications of confidence limits and effect sizes in sport research. *The Open Sports Sciences Journal*, 1(1).
- Doma, K., Leicht, A.S., Schumann, M., Nagata, A., Senzaki, K. and Woods, C.E., 2019. Postactivation potentiation effect of overloaded cycling on subsequent cycling Wingate performance. *The Journal of sports medicine and physical fitness*, 59(2), pp.217-222.