28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Effects of Force-Power-Velocity resisted sprints during warm-up on running sprint performance and mechanical profile in national athletes: A preliminary study

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INTRODUCTION:
Resisted sprints are a useful training strategy to improve the early acceleration phases of a sprint (1), and may be an effective post-activation potentiation stimulus used to acutely improve sprint performance (2). A simple field method has been validated to compute the main sprint acceleration mechanical outputs (3,4), and several on-field systems can be used to do so such as radar and motorized linear encoder (5). Warm-up content for sprint races has not been often studied and explored, especially regarding the use of resistances to cover the full force-velocity spectrum of sprint acceleration. The aim of this preliminary study was to determine the effectiveness of an implementation of a force, power and velocity resisted sprints during warm-up on the force-velocity profile and the 40-m linear sprint running performance.
METHODS:
Five national level sprinters performed two warm-up sessions separated by one week. During the first warm-up session (CON), athletes performed their own individual warm-up followed by a load-velocity test. During the second warm-up session (FPV), athletes implemented at the end of their individual warm-up 3 resisted sprints (Force: 10-m against a load eliciting a 75% velocity decrease compared to their individual maximal unresisted velocity (Vdec), Power: 20-m at 50% Vdec, Velocity 30-m at 25% Vdec, and a final unresisted acceleration). Running times were computed every 5-m with the motorized linear encoder (1080 Sprint; 333 Hz), and the Force-velocity profiles for the best time trial of each session were computed from the radar (Stalker Pro II; 48 Hz) data with the method proposed by Samozino et al. Maximal velocity (Vmax), theoretical maximal velocity (V0) and horizontal component of the ground reaction force (F0), and maximal power (Pmax) were calculated. Mean, percentages of differences and effect sizes (ES) were computed.
RESULTS:
40-m time was similar (5.52±0.40 vs 5.53±0.36 s; +0.6%; ES=0.03) between CON and FPV warm-up sessions. Regarding the main sprint-acceleration variables computed from the radar raw data, Vmax (8.94±0.76 vs 8.97±0.67 m.s-1;+0.3%; ES=0.04) and V0 (9.47±0.90 vs 9.43±0.86 m.s-1;-0.4%; ES=0.05) were similar. Despite very small percentage of difference for relative F0 (7.18±1.07 vs 7.28±0.76 N.kg-1; +1.4%; ES=0.11) and Pmax (16.86±3.40 vs 17.04±2.72 W.kg-1; +1.1%; ES=0.06) no statistical differences were found between warm-up sessions.
CONCLUSION:
The results of this preliminary study on a small sample size of national athletes seem to show that implementing force, power and velocity resisted sprints during warm-up is a feasible strategy. Indeed, this could have no negative effects on sprint-acceleration mechanical profile and 40-m sprint performance. However, a larger number of athletes from various level should be included to confirm the results obtained.

1) Petrakos et al. (2016)
2) Zisi et al. (2022)
3) Samozino et al. (2016)
4) Morin et al. (2019)
5) Fornasier-Santos et al. (2022)

Topic: Training and Testing

Presentation Oral