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Muscle typology underpins sprint cycling characteristics in elite track cyclists

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INTRODUCTION:
Maximal power output (i.e., Pmax) and the ability to maintain Pmax (i.e., fatigue rate) are key determinants of track sprint cycling events. Track sprint cyclists have been categorized as possessing fast-typology (i.e., a greater proportion of type II fibres)1,2. Nonetheless, it is unknown whether muscle typology underpins the key characteristics (i.e., Pmax and fatigue rate) of track sprint cycling. The aim of this study was to determine whether muscle typology is associated with the key mechanical characteristics of track sprint cycling in elite track cyclists.
METHODS:
Ten male (84.3 ± 8.3 kg) and eight female (66.5 ± 9.4 kg) elite track cyclists volunteered for this study. Five cyclists were classified as world-class athletes, with the remaining thirteen cyclists classified as elite3. Within this cohort, 13 were track sprint and 5 were track endurance specialists. Subjects attended a laboratory testing session where they performed a sprint cycling protocol on either a Lode or custom motor driven SRM ergometer, both with a standard crank length of 170 mm. The laboratory session was comprised of three 5-s maximal sprints completed in isokinetic mode at fixed cadences (80, 120, 160 rev·min-1). Data from the ergometers and power meters were stroked averaged and fatigue free torque- and power-cadence profiles were constructed. Pmax and the corresponding optimal cadence (Fopt) were identified following best practice methodology4. Cyclists then completed two optimised sprints; a 5 s and 15 s maximal effort which were completed at the athletes Fopt, whereby stroke averaged data was used to quantify fatigue per pedal stroke. Carnosine content was quantified by proton magnetic resonance spectroscopy in the gastrocnemius and soleus and expressed as an aggregate Z-score to estimate muscle typology. The association between muscle typology and the mechanical parameters of the torque- and power-cadence profiles and fatigue rate per pedal stroke in the optimized sprint were analysed using linear regression.
RESULTS:
Muscle typology explained 50% and 55% of the variation in Pmax in males and females, respectively ($P<0.05$), whereby a higher carnosine Z-score (i.e., greater estimated proportion of type II fibres) was associated with a greater Pmax. In contrast, while muscle typology explained 41% of the variation in the fatigue rate of male track cyclists (i.e., a higher carnosine Z-score was associated with a greater fatigue rate), there was a trivial association in female track cyclists.
CONCLUSION:
These findings indicate that for male track cyclists there is a trade-off between Pmax and the decrement in power output per pedal stroke with variation in muscle typology, while Pmax is also underpinned by muscle typology in elite female track cyclists.
References:
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