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

Relationships between competitive ability and pre-activation time in leg muscles during sprint running and drop jumping in college track and field athletes

Yokota, K., Oga, R., Tamaki, H.

National Institute of Fitness and Sports

INTRODUCTION:
Pre-activation (PA) of agonist/antagonist muscles prior to ground contact during running and jumping movements is one of the human motor control mechanisms, and according to previous reports, it has a positive impact on motor performance. There is, however, little information available regarding the relationship between the onset time of PA and subsequent motor performance in Japanese college track and field athletes. We investigated the relationships between the onset time of PA in the lower leg muscles during drop jumps (DJs), sprint running and jumping performance, and competitive ability in Japanese college track and field athletes.
METHODS:
Fourteen male college track and field athletes performed both DJs from a 60 cm-high platform and sprint running for 20 m. We recorded surface electromyographic (sEMG) signals from their tibialis anterior, lateral gastrocnemius (LG), medial gastrocnemius, and soleus muscles during these tests. We calculated a DJ index by dividing the jumping height (m) by the ground contact time (s). The best International Association of Athletics Federations (IAAF) score of each runner was used as a variable representing individual running performance. The sEMG signals were normalized (expressed as a percentage of the maximum voluntary contraction) and the PA time for each muscle was measured as the interval between the onset of muscle activation and ground contact, assessed via sEMG.
RESULTS:
There was no significant correlation between the DJ index and PA time for any of the muscles during DJs. However, PA time in the tibialis anterior during the sprint running was significantly correlated with IAAF score ($r = -0.68$, $p < 0.05$). There was also a strong, although nonlinear, relationship between the IAAF score and PA time in the LG during the 20 m sprint running ($R2 = 0.928$).
CONCLUSION:
Our data suggest that the PA time in the LG during the 20 m sprint running and competitive ability can be modeled using a second-order regression, revealing a link between muscle pre-activation strategy in the LG and sprint-running performance in college sprint runners. The concept of pre-activation time in the leg muscles predicting the sprint-running performance of athletes may thus be worthy of further discussion.

Topic: **Neuromuscular Physiology**

Presentation **E-poster**