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

Muscle activity timing and amplitude in the early acceleration phase of curve sprinting

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INTRODUCTION:
Surface electromyography (sEMG) helps understand the muscular origin of sprinting technique. It has been shown that maximal hip flexion and maximal hip extension angles are reached later at maximal velocity in the curve than in the straight (1). The hip flexors and extensors activation timings were shown to influence the step frequency at maximal velocity (2). Since the inside leg step frequency is reduced within the curve (1), this could result from delayed inside leg activation timings. The aim of the present experimentation was to investigate the onset of muscle activity and the sEMG amplitude of hip flexors and hip extensors over the early acceleration phase in straight-line and curve sprinting.
METHODS:
9 (6 male and 3 female) experienced-to-elite curve sprinters (mean ± SD: age = 22.8 ± 3.0 years; body mass = 70.8 ± 5.7 kg; height = 177.3 ± 6.6 cm) volunteered to participate in this study. After a 45-min self managed warm-up, the participants performed 10 and 40-m sprints within two sprinting conditions in a randomized order: straight-line and curve on a reconstructed lane 5 (radius = 41.58 m) of a standard athletics track.
sEMG (Delsys Inc., 2148 Hz) were positioned on the Rectus Femoris (RF) and Biceps Femoris long head (BF) of both left (L) and right (R) legs (3). After full-wave rectification and band-pass filtering (20-500 Hz), the onset timings (% of stance duration) of muscle activity were identified using Teager-Kaiser energy operator (TKEO) and Approximated Generalized Likelihood Ratio (AGLR) (4). Mean sEMG amplitudes were normalised to the maximal activity of the corresponding muscle detected over the straight-line 40-m sprints. Two-way RM ANOVAs were performed.
RESULTS:
There were no significant effects for condition or side neither for the onsets of muscle activity of RF ($p > 0.283$) and BF ($p > 0.412$); nor for the sEMG amplitude of RF ($p > 0.718$) and BF ($p > 0.111$).
CONCLUSION:
The early acceleration phase of curve sprinting on a reconstructed lane 5 did not result in alterations of neither the onset timings nor the magnitudes of hip flexors and hip extensors muscular activity in comparison to the straight-line. Yet, this analysis only focussed on the first steps of a sprint. As already suggested by Judson et al. (5) regarding the ground reaction forces; the effect of the bend on the muscular activity during the acceleration phase could accumulate with the increasing velocity. Therefore, investigations should aim to investigate whether differences in muscular activity between straight-line and curve sprinting can be found in the later stages of the acceleration phase.
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Topic: Biomechanics

Presentation Oral

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