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Effect of legs starting block position on kinetics and kinematics of an hemiplegic/brain impairement T37 elite sprinter

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INTRODUCTION:
Brain impairment (BI) significantly slows down the movement and leads to a reduction of the range of motion of the movement (ROM) and forces (Bezodis et al., 2020; Connick et al., 2015). Specifically, for hemiplegic, this loss of force is not the same in the right or the left side (Beckman et al., 2016). Thus, in starting block sprint phase, the force developed by the right and left leg should be different and the ability of the sprinter to have a balance of force between the right and left could be a strategy to improve sprint performance. The purpose of this study was to compare legs starting block position on kinetics and kinematics of a hemiplegic elite sprinter
METHODS:
An elite sprinter (T37) performed 6 maximal 40-m sprints from starting blocks. The athlete realised three sprints with the paretic side in the front position (PSF) in the starting block and three sprints with the paretic side in the rear position (PSR). Average forces, impulses, were measured from the start to the 4th step using force plate (Kisler ; 1000 Hz). During the entire race, instantaneous velocity, maximal velocity, time contact, time flight, steps rate and lenght (V, Vmax,Tc, Tv, SR and SL) were measured using radar (Stalker Pro II; 48 Hz) and an optojump (Microgate, Bolzano). Using the velocity time curve and the model proposed by Samozino et al. (2016), the theoretical force (F0), velocity (V0) and maximal power (Pmax) were calculated.
RESULTS:
The results demonstrated that lateral force and impulse were lower in the PSF condition (84 ± 75 vs 70 ± 46 N and 29 ± 41 vs 20 ± 23 N.s-1). Tc, Tv, SR and SL, averaged on the entire sprint, were not different between PSF and PSR, respectively for Tc, 0.142 ± 0.018 vs 0.145 ± 0.022 s for Tv, 0.103 ± 0.021 vs 0.102 ± 0.02 s, for SR 4.1 ± 0.1 vs 4.1 ± 0.4 Hz and for SL 168.5 ± 36.7 vs 168.4 ± 37.1 cm. Concerning the force velocity profile, F0 and Pmax were greater for PSF condition (respectively for F0 373 ± 25 vs 358 ± 1 N and for Pmax 795 ± 49 vs 766 ± 8 W).
CONCLUSION:
For this elite athlete used to start with both feet in front or in a rear position, starting in the PSF condition was the best option. Indeed, less lateral force and impulse are created and a lesser variability in Tc, Tf and SR from the 1st to the 12th step for PSR condition was observed. In addition, F0, Pmax, forces and impulses were greater in PSF compared to PSR (around 4%). The PSF departure may allow a more favourable force transmission during the first step that lead to an improvement of the acceleration phase.

Topic: **Training and Testing**

Presentation **Poster**