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Elbow flexors-extensors muscles torque and velocity performance in high level wheelchair basketball players

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Introduction

During propulsion, the elbow showed alternating flexion/extension patterns (Rao et al., 1996). The movement dynamics in wheelchair basketball (WB) are specifically related to handling the wheelchair in sprinting, bracking, turning and blocking. The ability to accelerate the wheelchair from standstill will be determinate by several components, such as explosive strength and propulsion technique (Vanlandewijck et al., 2001).

Purpose

To analyse the elbow torque and the relationship with the speed of the WB players in a specific test of performance and to identify the differences in elbow torque between dominant side (DS) and non-dominant side (NDS).

Methods

12 men, WB players of the Spanish National Team took part in: a) 2 series of 15 m speed test with passing and braking, and b) 2 isokinetic test of the flexors and extensors elbow muscles. Speed performance were measured in real time by a laser system, Biolasersport® (Ferro, 2012; Ferro & Floria, 2010) at 2000 Hz. Average velocity (V_m) and maximum velocity (V_{max}) were measured in five sections (0 -3 m, 3-5 m, 5-7.5 m, 7.5-15 m), and the braking distance (D_b) after 15 m. During test, WB players had to run al maximum speed, to brake and to pass the ball in the distances of 5 m and 7.5 m, again to get the maximum velocity until 15 m and, finally, to brake in the minimum distance. Peak torque (PT) was analyzed with dynamometer isokinetic Biodex® Multi-Joint System - PRO (Biodex Corp., Shirley, NY). The isokinetic test was performed in the seated position with the shoulder placed in shoulder abduction at 45°. The angular velocities tested were 60°/s and 150°/s for both elbows. A paired student's t-test and Spearman correlation were used with significance level at $p < .05$. The intraclass correlation coefficient (ICC) for all the velocity variables were 0.80 to 0.89.

Results

DS and NDS extensor at 150°/s and, NDS extensor and DS flexor at 60°/s, presented significant correlation in the V_{max} in 0-3 m and 7.5-15 m, and in the V_m in 0-3 m. At 150°/s, DS and NDS extensor also showed correlation with the V_m in 7.5-15 m and DS extensor in 5-7.5 m in both V_m and V_{max} . In DS flexor at 150°/s had correlation with V_{max} in 7.5-15 m and with V_m in 0-3 m. Regarding DS extensor at 60°/s, there were correlation with V_m in 0-3 m and 7.5-15 m ($p < .05$). There was significant difference in flexor elbow at 60°/s between DS and NDS ($77.25 \pm 17,27$ vs $68.33 \pm 13,52$ Nm, respectively; $p = .007$).



Conclusions

Flexors and extensors elbow muscles could contribute to gain speed in a 15 m velocity test in WB players, highlighting that the PT at 150°/s of elbow extension showed correlation with more sections of the test. Asymmetry in elbow flexion PT at 60°/s in the torque applied by DS and NDS was indicative of imbalance in the flexor muscles. We suggest that force training should be increased in WB players, and also, to work on compensate DS and NDS.

Keyword(s): Sprint test, peak torque, force muscle, kinematics

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