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PROGRAM & ABSTRACT BOOK プログラムとアブストラクトの本



COMPARISON BETWEEN BACKWARD AND FORWARD PROPULSION IN WHEELCHAIR BADMINTON

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INTRODUCTION

Wheelchair badminton is a recent sport that became a Paralympic discipline with the 2021 Tokyo games [1]. The peculiarity of this sport lies in the movements of the athletes which perform only successive forward and backward propulsion. Only four studies have investigated the differences between these two types of propulsion outside a sport setting [2-5]. However, backward propulsion modifies the kinematics of the propulsion of the athletes, which could thus act as a protective factor for the risk of injury [2][4]. However, these results relate to non-athletes and the results could differ in experienced athletes. Therefore, the objective of our study is to compare kinematics of forward and backward propulsion in experienced badminton athletes.

METHODS

18 French wheelchair badminton players (41.4±9.3 years; 64.9±11.1kg; 169.7±13.7cm) were recruited during the 2021 French Championships in Nueil-les-Aubiers. The athletes did not have any injuries or pain affecting the propulsion of the wheelchair. They performed a consecutive forward and backward propulsion test for 1 min on a 3m straight line on a badminton court with a badminton racket. This test was created to reproduce the conditions encountered during the matches. The athletes used their own wheelchairs equipped with inertial measurement units (IMU) on the wheels. These tools allowed us to collect the following kinematic data: maximum first push velocity, maximum overall velocity, mean acceleration during the first push and mean deceleration from the last push. Fig. 1 illustrates the assessed variables.

RESULTS

Table 1: Comparison between backward and forward propulsion
With *: $p < 0.01$, **: $p < 0.001$

	Forward propulsion	Backward propulsion
	Mean (±sd)	Mean (±sd)
Maximum first push velocity (m/s)	4.57 (±0.69)	4.08 (±0.65)**
Maximum overall velocity (m/s)	3.47 (±0.71)	2.93 (±0.67)*
Mean acceleration (m/s ²)	6.08 (±1.60)	6.41 (±1.43)
Mean deceleration (m/s ²)	-10.19 (±4.26)	-9.52 (±3.45)

Significant differences between forward and backward propulsion were noted for all measured parameters.

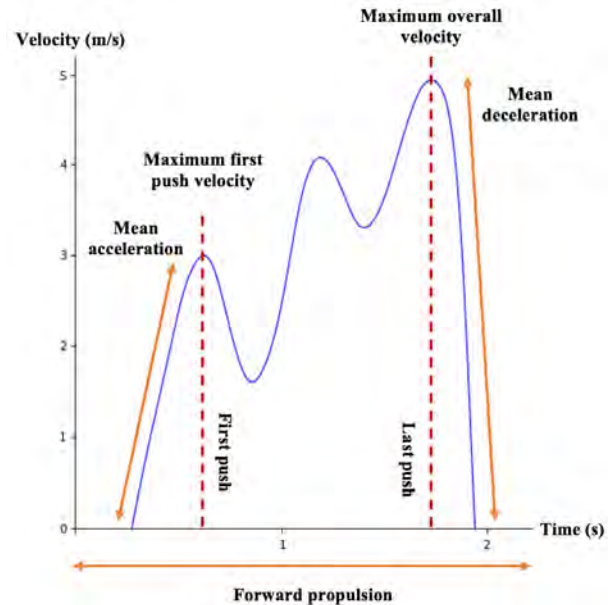


Fig 1: Propulsion velocity during forward propulsion

Maximum first push velocity, maximum overall velocity and mean deceleration were higher in forward propulsion than in backward propulsion, while **mean** acceleration was higher in backward propulsion vs forward propulsion.

CONCLUSION

The results are in the direction of a more efficient forward propulsion than backward. However, the mean acceleration is greater in backward propulsion without having a greater maximum first push and overall velocity. This may indicate that athletes have different propulsion kinematics depending on the chosen propulsion mode. These results are interesting for athletes and trainers who should promote training phases in backward propulsion and the transition from forward to backward propulsion to improve the performance of athletes.

[1] Janiaczyk. *Fizjoterapia* **23**(4): 66-72, 2015
 [2] Haubert et al. *JSCM* **43**(5): 594-606, 2020
 [3] Linden et al. *Med Sci Sports Exerc* **25**(11): 1265-8, 1993
 [4] Mason et al. *J Spinal Cord Med* **38**(4): 476-84, 2015
 [5] Salvi et al. *Arch Phys Med Rehabil* **79**(1): 36-40, 1998