

Follow-up and optimisation of the stroke kinematics of a Paralympic wheelchair sprinter in the cycle 2013-2016

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ABSTRACT

Purpose: To analyse the variations in the stroke kinematics of an elite wheelchair sprinter in the 100m event over a Paralympic cycle and, modelling the optimal stroke rate-stroke length (SR-SL) combination to break the personal best (PB) and the European Record (ER).
Methodology: A T52 wheelchair sprinter that is European multi-medallist, finalist at World Championships and Paralympic Games was monitored in the Paralympic cycle 2013-2016. The 100m events raced were recorded by a panning camera set-up on the stands.
Results: It was noted the narrowest 95CI at the 38.5m mark. The SR and SL 95% confidence interval (95CI) became wider from this mark onwards. Conversely, the 95CI of the velocity is prone to become narrow from the 38.5m mark onwards.
Conclusion: The best SR-SL combination was a mean 135.50c/min-2.53m to break the PB, and 137.88c/min-2.57m the ER.

INTRODUCTION

Background: Wheelchair sprints are some of the most popular event at Paralympic Games. Several elite wheelchair sprinters are monitored and followed-up over the Paralympic cycle. Biomechanics and race analysis are services that can be provided to Para athletes.
Aim: To analyse the variations in the stroke kinematics of an elite wheelchair sprinter in the 100m event over a Paralympic cycle and, modelling the optimal stroke rate-stroke length (SR-SL) combination to break the personal best (PB) and the European Record (ER).
Hypotheses:
 i) SR, SL and Velocity present significant variations over the Paralympic cycle.
 ii) There is an optimal SR-SL combination to break the PB and the ER.

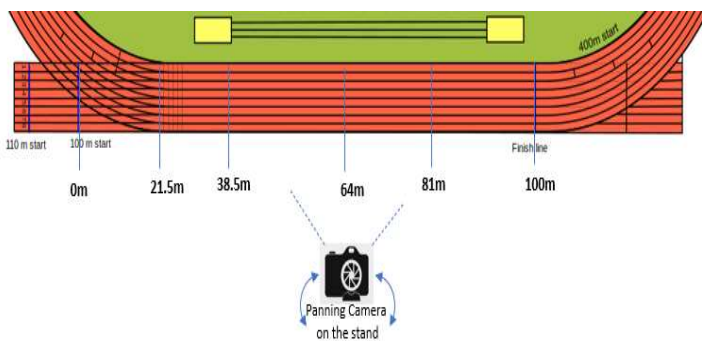
METHODOLOGY

Participant:



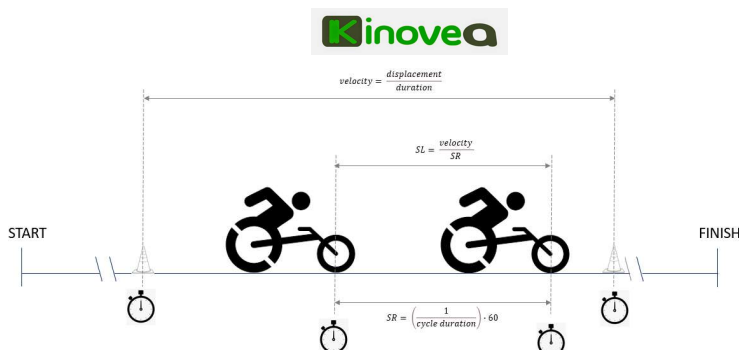
- Male
- T52 wheelchair sprinter
- European multi-medallist
- Finalist at World Championships
- Finalist at Paralympic Games

Experimental Set-up:



Data analysis:

All T52 100m events raced in the Paralympic cycle 2013-2016.



RESULTS

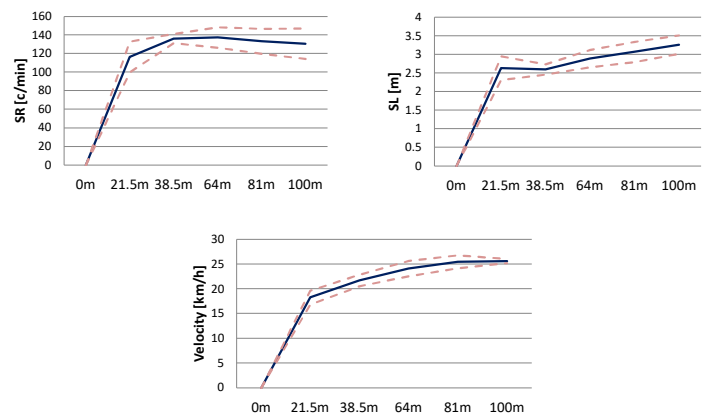


Figure 1: Variations of Stroke Rate (SR), Stroke Length (SL) and Velocity over the T52 100m event in the Paralympic cycle 2013-2016. Solid line – mean value; Dash line – 95% confidence interval.

Table 2: SR-SL optimisation to break the Personal Best (PB) and European Record (ER).

	Target-Time [s]	Velocity [km/h]	SR [c/min]	SL [m]
PB optimisation	17.50	20.57	135.50	2.53
ER optimisation	16.90	21.30	137.88	2.57

DISCUSSION & CONCLUSIONS

- 1) In the velocity, SR and SL, it was noted the narrowest 95CI at the 38.5m mark.
- 2) The SR and SL 95CI became wider from this mark onwards.
- 3) Conversely, the 95CI of the velocity is prone to become narrow from the 38.5m mark onwards.

This suggests that different SR-SL combinations were adopted to reach a given velocity.

- 4) An optimisation solution was employed to yield the best mean SR-SL combination over the 100m event to break the PB (target time: 17.50s) and the ER (target time: 16.90s).

The best SR-SL combination was a mean 135.50c/min-2.53m to break the PB, and 137.88c/min-2.57m the ER.

ACKNOWLEDGEMENTS

To the wheelchair sprinter for his support over the Paralympic cycle.