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The relationship between load-velocity profiles and spatiotemporal parameters in elite 100 m and 200 m freestyle swimmers

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INTRODUCTION:
Power, strength and speed assessment is of great interest when monitoring swimming performance (1). In this perspective, semi-tethered swimming tests are commonly used to evaluate dynamic parameters based on load-velocity (L-V) profiles in conditions consistent with free swimming (2). Maximal predicted velocity (V0) and maximal predicted load (L0) assessed by a L-V profiling, has been reported respectively as strongly and moderately correlated with the mean velocity in the 50 m butterfly (3) as well as the 50 m freestyle (4). Nevertheless, it is unclear if L-V profiling is associated with performance in other distances. Therefore, the aim of this study was to test the correlation between load-velocity profiling and performance parameters in the 100 m and 200 m freestyle events.
METHODS:
Seven male elite swimmers (100 m freestyle best time: 51.17 ± 1.04 s; 770 ± 49 FINA points) completed a freestyle load-velocity profiling using a resisted sprint protocol. Swimmers were asked to swim four all-out distances (25, 25, 20 and 15 m) against increasing loads (0.1, 2.0, 4.0 and 6.0 kg respectively). Average swimming speed was obtained from three cycles on the middle of the sprint (4). V0, L0 and the slope of L-V linear regression were computed from the testing session. Swimmers competed the 200 m & 100 m freestyle events in a 50 m pool within 3-4 days after the tests, at an international competition. Video analysis of both races were performed to compute average values of speed (Vmean), stroke length (SL) and stroke rate (SR). The normality of all variables was verified using a Shapiro-Wilk test and Pearson correlations were computed between race performance parameters and L-V results (α=5%).
RESULTS:
Main results show that, on the 100 m, SR and V0 as well as SL and L0 have a low negative correlation (r= -0.13 and r= -0.46 respectively). On the other hand, on the 200m, SR and V0 as well as SL and L0 show large positive correlations (r= 0.69 and r= 0.53 respectively). Slope has also a large correlation with Vmean on the 100 m (r=0.59) but a trivial correlation with Vmean on the 200 m (r= 0.09). Other results indicate a nearly perfect correlation of SR in the 100m with L0 (r= 0.91) and Slope (r= 0.91).
CONCLUSION:
It appears that the correlations between L-V profiling and performance parameters differ depending on the race distance, each one involving specific physiological and biomechanical constraints. Indeed, this conclusion could be related to active drag as the correlation between the slope of the L-V regression, which is described as an indicator of drag (5), and the average speed over 100 m is strong whereas negligible with the average speed over 200 m.

1. Shionoya, A. (1999)
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