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Physiological, Biomechanical and Anthropometrical Predictors of Sprint Swimming Performance in Adolescent Swimmers

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ABSTRACT

The purpose of this study was to analyze the relationships between 100-m front crawl swimming performance and relevant biomechanical, anthropometrical and physiological parameters in male adolescent swimmers. Twenty five male swimmers (mean ± SD: age 15.2 ± 1.9 years; height 1.76 ± 0.09 m; body mass 63.3 ± 10.9 kg) performed an all-out 100-m front crawl swimming test in a 25-m pool. A respiratory snorkel and valve system with low hydrodynamic resistance was used to collect expired air. Oxygen uptake was measured breath-by-breath by a portable metabolic cart. Swimming velocity, stroke rate (SR), stroke length and stroke index (SI) were assessed during the test by time video analysis. Blood samples for lactate measurement were taken from the fingertip pre exercise and at the third and fifth minute of recovery to estimate net blood lactate accumulation (ΔLa). The energy cost of swimming was estimated from oxygen uptake and blood lactate energy equivalent values. Basic anthropometry included body height, body mass and arm span. Body composition parameters were measured using dual-energy X-ray absorptiometry (DXA). Results indicate that biomechanical factors (90.3%) explained most of 100-m front crawl swimming performance variability in these adolescent male swimmers, followed by anthropometrical (45.8%) and physiological (45.2%) parameters. SI was the best single predictor of performance, while arm span and ΔLa were the best anthropometrical and physiological indicators, respectively. SI and SR alone explained 92.6% of the variance in competitive performance. These results confirm the importance of considering specific stroke technical parameters when predicting success in young swimmers.

Key words: oxygen uptake, stroke index, energy cost, front crawl

Key Points

- This study investigated the influence of different anthropometrical, physiological and biomechanical parameters on 100-m swimming performance in adolescent boys.
- Biomechanical factors contributed most to sprint swimming performance in these young

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