Longitudinal study in elite male swimmers: variations on performance, energetic and biomechanic profiles

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INTRODUCTION Monitoring the factors that affect performance is one of the most important issues for coaches and researchers in swimming science. This kind of information in longitudinal terms is crucial to determine the effectiveness of the previous load and to adjust training methods in order to enhance performance.

MATERIALS AND METHODS Nine elite male swimmers were evaluated on six occasions over two consecutive seasons (2009-2010 and 2010-2011). On each occasion, an incremental exercise test was applied to obtain the energetic and biomechanical data. Measurements were made of: (i) swimming velocity at 4 mmol L^{-1} of blood lactate concentration (V_4) and the peak blood lactate after exercise (La_{peak}) as energetic variables; (ii) stroke frequency (SF), stroke length (SL), stroke index (SI) and propelling efficiency (η_p) as biomechanical measures. Performance was determined based on official time's lists of 200 m freestyle event. Friedman Test and the Wilcoxon Signed-Rank Test were used to analyze the within and between season changes in performance, energetical and biomechanical variables. Cohen Kappa tracking index (K) was used to detect inter-individual differences in seasonal adaptations.

RESULTS Most of energetic and biomechanical variables presented no significant variations during the two years of training. The only exception was the La_{peak} with a significant increase within and between seasons ($La_{peakTP1}$ = 9.87 ± 2.40 mmol.l^{-1}; $La_{peakTP2}$ = 11.38 ± 2.56 mmol.l^{-1}; $La_{peakTP3}$ = 13.06 ± 3.26 mmol.l^{-1}; $La_{peakTP4}$ = 10.94 ± 2.90 mmol.l^{-1}; $La_{peakTP5}$ = 12.87 ± 1.97 mmol.l^{-1}; $La_{peakTP6}$ = 12.98 ± 2.69 mmol.l^{-1}; p = 0.05). The 200 m competition performance also presented no significant variations during such period. Low K values were determined for the most of the variables assessed suggesting high variability in the swimmer's response to the training.

CONCUSSIONS The main findings were that elite swimmers demonstrate slight variations in their performance, energetic and biomechanical profiles within and between seasons. Plus, it seems that each swimmer has a singular way in responding to the training load applied. In this sense, individual training sets are required to induce further adaptations on energetic and biomechanical aspects in order to enhance performance.