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Can concurrent teaching promote equal biomechanical adaptations at front crawl and backstroke swimming?

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Purpose: The biomechanical adaptations in front crawl and backstroke swimming, as influenced by the implementation of a concurrent teaching programme were analysed. *Methods*: Sixteen participants (19.75 ± 1.13 years) underwent a 30 weeks intervention characterized by an increasing complexity to accomplish motor skills in the following order: (i) lower limbs propulsion; (ii) lower limbs propulsion synchronized with breathing cycle; (iii) lower limbs propulsion synchronized with one upper limb action; (iv) lower limbs propulsion synchronized with both breathing cycle and one upper limb action; (v) full swimming stroke; (vi) motor trajectory of the arms stroke. Performance and biomechanics were measured at front crawl and backstroke during three time points throughout the programme. *Results*: There were improvements in performance over time at front crawl (21.49 s to 19.99 s, $p < 0.01$) and backstroke (27.15 s to 24.60 s, $p = 0.01$). Significant improvements were found for velocity at front crawl (1.13 m/s to 1.22 m/s, $p < 0.01$) and backstroke (0.92 m/s to 1.00 m/s, $p < 0.01$). Stroke frequency increased at backstroke (0.64 to 0.73 Hz, $p = 0.01$), while the intra-cyclic variation of the velocity decreased at front crawl (0.13 to 0.12%, $p = 0.02$). There was also a moderate-high inter-subject variability in response to the programme. *Conclusions*: These findings prove that a programme of 30 weeks teaching concurrently front crawl and backstroke is effective to promote similar biomechanical adaptations in low-tier swimmers. However, each subject shows an individual response to better adapt the biomechanical actions and to reach a higher level of expertise.

Key words: *expertise, kinematics, swimmers, programme*

1. Introduction

Swimming is quite a complex movement that implies non-common actions in terms of balance and propulsion. There is a need to have a horizontal balance without plantar support suffering an effect from

Expertise in the water has been assessed by experimental testing and numerical methods [2]. Numerical methods are characterized by the introduction of selected input data, processing data according to given mechanical equations and thereafter collecting the output data. Mean swimming velocity (v) is considered the best variable to assess learning outcome.