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Energy cost and body centre of mass' 3D intracycle velocity variation in swimming.

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Abstract

The purpose of this study was to examine the relationship between the energy cost (C) and the 3D intracycle velocity variation (IVV; swimming direction--x, vertical--y and lateral--z axes) throughout the 200 m front crawl event. Ten international level swimmers performed a maximal 200 m front crawl swim followed by 50, 100 and 150 m bouts at the same pace as in the 200 m splits. Oxygen consumption was measured during the bouts and blood samples were collected before and after each one. The C was calculated for each 50 m lap as the ratio of the total energy expenditure (three energy pathways) to the distance. A respiratory snorkel and valve system with low hydrodynamic resistance was used to measure pulmonary ventilation and to collect breathing air samples. Two above water and four underwater cameras videotaped the swim bouts and thereafter APAS was used to assess the centre of mass IVV (x, y and z components). The increase in the C was significantly associated with the increase in the IVV in x for the first 50 m lap ($R = -0.83$, $P < 0.01$). It is concluded that the IVV relationship with C in a competitive event does not present the direct relationship found in the literature, revealing a great specificity, which suggests that the relation between these two parameters could not be used as a performance predictor in competitive events.

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