

determine the differences between swimmers.

**DISCUSSION & CONCLUSION** However, the records show a clear behavioral similarity compared the result with a general pattern of the butterfly technique. Conclusion: As we can see that the potential quality of this instrument is evident by the patterns obtained from a temporal sequence.

**KEY WORDS** Technical Analysis, Patterns, Butterfly, Chronology

## Kinematical constrictions during breaststroke swimming with a portable gas analyzer snorkel

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**OBJECTIVE** To determine the kinematical constrictions in maximal breaststroke swimming bouts with the AquaTrainer® snorkel (Cosmed, Rome, Italy).

**METHODS** Seven national level breaststrokers performed two maximal bouts of 100-m swims (separated by 48 hours): (i) one bout connected to the AquaTrainer® snorkel (constricted swim); (ii) one bout without the snorkel (free swim). The swims were videotaped in sagittal plane with a pair of cameras providing a dual projection from both above and underwater. The study comprised kinematical analysis of stroke cycles using APAS and a VCR (f = 50 Hz). To create a single dual projection image, the independent digitalization from both cameras was reconstructed with the help of a calibration volume and a 0.01). The  $\pm 2D$ -DLT algorithm. Digitalization reliability was high (ICC=0.97 following measures were assessed: (i) swimming performance (T100); (ii) stroke parameters (stroke cycle period, stroke rate, stroke length and mean swimming velocity); (iii) estimated swimming efficiency by the swimming index; (iv) speed fluctuation (dv) and the mathematical characterization of dv. Mean dv curves normalized to time were computed with MATLAB. The polynomial regression (7th power) between dv and normalized duration of the full stroke cycle was calculated. Wilcoxon tests were performed to compare significant differences in the dependent variables (performance, stroke mechanics and efficiency variables) according to the independent variable (free versus constricted swim) ( $P \leq 0.05$ ).

**RESULTS** T100 was significantly higher for constricted swimming than in free condition (6.26%;  $Z = -2.366$ ;  $P = 0.02$ ). The remaining variables showed no significant differences between the two swimming conditions. In both exercise conditions, dv was characterized by a bi-modal profile. The determination coefficients for the dv mathematical model were significant ( $P < 0.01$ ) and 0.47.

**DISCUSSION & CONCLUSION** None of the stroke mechanics and efficiency variables evaluated presented significant differences between both swimming conditions. The AquaTrainer® constrictions might be related mainly to the start and turn phases. (Supported by FCT grant: POCI/DES/58362/2004)

**KEYWORDS** Kinematical constrictions, swimming performance, stroke parameters, AquaTrainer snorkel, breakstroke

## Relation between energy expenditure and time spent in physical activity and fitness in middle age adults

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**OBJECTIVE** Physical fitness is often considered as a good measure of individual physical activity. The aim of the study was to assess the relations between energy expenditure and time spent in physical activity of different intensities and aerobic fitness indicators in adults.

**METHODS** In the sample consisted of employed urban living adults (31 men and 20 women aged  $40 \pm 3.7$  years). Relation between energy expenditure and time spent in physical activity (PA) and fitness were analyzed. Energy expenditure (EE)-total relative EE (TEErel) and relative EE during PA (AEErel), and the time spent sedentary and in low (1.5-3MET) moderate (3-6MET) and high ( $> 6$ MET) intensity PA was measured by combined system Sense Wear Armband™ (Body Media, Pittsburgh, PA) during seven consecutive days. Aerobic fitness indicators – maximal oxygen uptake ( $VO_{2maxrel}$ ), aerobic threshold ( $VO_{2AT}$ ) and anaerobic threshold ( $VO_{2AnT}$ ) were determined during direct treadmill spiroergometric testing using K4 Cosmed equipment.

**RESULTS** To reveal the relations between EE and aerobic fitness indicators Pearson's partial correlations controlled for gender were calculated. The results showed significant positive correlations between the EE indicators (total and EE