

performance in 100, 200 and 400 m (T100, T200 and T400). Notably, MLSS and the different methods of CV determination were highly correlated to swimming performances. CV determination in swimming should be interpreted with caution, since it is method dependent, although is still a valuable tool to assess training adaptations and could be useful in training prescription and evaluation. Future studies should consider gas exchange and kinematic analysis, aiming to deepen the knowledge regarding the aerobic power training zone in swimming.

#### *4.6.4 Anthropometry, body composition and physical capacities profile of cadet swimmers A and B*

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This study sought to analyze the relationship between anthropometry, body composition and physical capacities in cadet swimmers. 8 Cadets B (10.13±0.83 years, 1.48±0.04 m of height, 38.34±4.73 kg of weight) and 8 Cadetes A (11.75±0.46 years of age, 1.62±0.06 m of height, 51.65±7.86 kg of weight) were evaluated. Height and arm span were determined with a measuring tape. Body mass was assessed through bioelectric impedance analysis method (Tanita BC 420S MA, Japan). Countermovement jump (CMJ) was determined using Ergojump System (Byomedic, SCP, Spain) and maximal isometric strength of the dominant hand was evaluated using a digital dynamometer (handgrip - HG; Camry 90 kg). Lower limb flexibility was measured with a seat and reach box. Height, weight, muscular mass (B 33.89±3.44 vs A 44.78±5.03 kg)

HG (B  $18.63 \pm 2.66$  vs A  $22.35 \pm 3.63$  kg) and arm span (B  $1.49 \pm 0.05$  vs A  $1.64 \pm 0.08$  m) were significantly different ( $p < 0.01$ ), contrary to body fat (B  $6.55 \pm 2.57$  vs A  $10.26 \pm 5.05$  %), H<sub>2</sub>O (B  $66.65 \pm 25.65$  vs A  $64.35 \pm 4.63$  %), CMJ (B  $25.70 \pm 4.04$  vs A  $23.11 \pm 4.81$  cm) and lower limb flexibility (B  $0.88 \pm 12.18$  vs A  $0.50 \pm 7.31$  cm). Only in Cadets B correlations were found between physical capacities, namely CMJ and HG ( $r = 0.72$ ;  $p < 0.05$ ). In Portugal, cadets include different preadolescence ages (A male 12 and female 11 years old / B male 10 and 11 and female 9 and 10 years old), our results suggest that a careful analysis should occur when defining the training groups and training load (number and duration of sessions) in this age-group in swimming.

#### *4.6.5 From Exercise Physiology to Network Physiology of Exercise*

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Exercise Physiology (EP) and its main research directions, strongly influenced by reductionism, are systematically ignoring fundamental properties of complex adaptive systems. The progressive focus of EP toward Genetics and Molecular Biology has emphasized the collection of integrated analytical approaches that composes the OMICS and contributed to the field of Molecular Exercise Physiology, but has not substantially changed the scenario. Integrative Exercise Physiology approaches, methodologically based on statistical inference techniques and focused on timeless vertical, bottom-up mechanistic causation (from the sub-cellular and cellular levels to organ and systemic functions), are not sufficient to improve the current state of physiological research. Inspired by the new field of Network Physiology and Complex Systems Science, Network Physiology of Exercise emerges to transform the theoretical assumptions, the research program and the current practical issues of current EP. It focuses the research efforts on