

O0932 - Comparison of the anthropometrics, kinematics and kinetics in young swimmers of different competitive levels

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Abstract

Introduction

The biomechanics plays a major role in the performances delivered by young swimmers. However, the literature addresses mostly the differences in the kinematics across young swimmers of different competitive levels, being scarce on the kinetics. The aim was to compare the anthropometrics, kinematics and kinetics in young swimmers of different competitive levels.

Methods

Seventy-five boys (13.12 ± 1.65 yo) were split up into three groups of 25 swimmers (tiers 1, 2 and 3) according to their performance level. It was measured a set of anthropometrical features including the body mass, height, arm span and trunk transverse surface area; the latter by photogrammetry. The participants were invited to perform an all-out bout of 25m in front-crawl with in-water push-off start. Stroke frequency, stroke length, the ratio stroke length-arm span, swim speed, stroke index and speed fluctuation were assessed by a speedo-meter [3]. The propelling efficiency was estimated by a simple analytical model where the arms are assumed to be rotating like paddle wheels [3]. The velocity perturbation method was selected to compute the drag force and drag coefficient [1]. Dimensionless hydrodynamic parameters such as Froude number, hull speed and Reynold number were calculated as well [2]. Another analytical set of formulae was used to estimate the power to overcome drag, the power to transfer kinetic energy to water and power output [1]. ANOVA 1-way was calculated to analyse the variance across the three tiers ($p < 0.05$).

Results

There was a significant variation with moderate effect sizes in all anthropometric features but the trunk transverse surface area. Tier-1 swimmers were taller, heavier and with longer limbs than remaining counterparts. There were also significant variations in the stroke kinematics with moderate-large effect sizes. Tier-1 swimmers showed higher stroke frequency, stroke length, speed, stroke index and propelling efficiency but lower speed fluctuations. Reynold number, Froude number and hull speed were significantly higher in Tier-1 swimmers, denoting large effect sizes. The mechanical power delivered (to overcome drag, transfer kinetic energy to water and total output) was significantly higher in tier-1 swimmers, showing moderate effect sizes.

Discussion

It was noted significant variations, with moderate-large effect sizes, among the three tiers, for the vast majority of the selected variables. The better performances by tier-1 swimmers were related to their anthropometrics, swim kinematics and swim kinetics.

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References

1. Barbosa, T. M., et al. (2015a). *J Strength Cond Res* **29**(2) p440
2. Barbosa, T. M., et al. (2015b). *Scand J Med Sci Sports* **25**(2) e184
3. Morais, J. E., et al. (2017). *Int J Sports Physiol Perf* **12**(2) p198