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The papers published in this book of abstracts / proceedings were submitted to the Scientific Commission of the International Congress of Research Center in Sports Sciences, Health Sciences & Human Development, held on 11 and 12 November 2016, at the University of Évora, Évora, Portugal, under the topic of Exercise and Health, Sports and Human Development. The content of the abstracts is solely and exclusively of its authors responsibility. The editors and the Scientific Committee of the International Congress of Research Center in Sports Sciences, Health Sciences & Human Development do not assume any responsibility for the opinions and statements expressed by the authors. Partial reproduction of the texts and their use without commercial purposes is allowed, provided the source / reference is duly mentioned.

Abstracts

images subsequently processed for tridimensional reconstruction of two front crawl cycles (25 and 175 m laps). Eight physiological and 12 biomechanical parameters were assumed as input to estimate CM horizontal velocity at low-moderate, heavy and severe swimming intensity. Multilayer Perceptron (MLP) was implemented with the Levenberg-Marquardt as training algorithm (feed forward with one hidden layer of six neurons) and the Radial Basis Function (RBF; Gaussian) was built using orthogonal least squares algorithm. MLP and RBF, can predict the CM horizontal velocity (validation error < 5%) at low- moderate, heavy and severe swimming intensities based on physiological and biomechanical data (Table 1).

Intensity	Model	Training (%)	Validation (%)	All models (%)	Best Validation (%)
Low-moderate	MLP	5.51E-06 ± 8.65E-06	2.43 ± 1.44	0.49 ± 0.29	0.13
	RBF	6.72E-02 ± 4.54E-02	1.85 ± 1.16	0.42 ± 0.25	0.15
Heavy	MLP	5.36E-06 ± 8.56E-06	2.45 ± 1.61	0.49 ± 0.32	0.63
	RBF	1.28E-01 ± 4.33E-02	1.82 ± 0.92	0.47 ± 0.17	0.46
Severe	MLP	4.70E-06 ± 8.34E-06	3.89 ± 1.78	0.78 ± 0.36	0.51
	RBF	9.53E-02 ± 6.23E-02	2.78 ± 0.96	0.63 ± 0.20	1.11

This current study indicates that MLP and RBF can model and predict the CM horizontal swimming velocity at low-moderate, heavy and severe intensities using physiological and biomechanical data during a traditional training protocol.

Acknowledgement
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CFD comparison of friction and pressure drag between road and time trial helmets for wheelchair racing.

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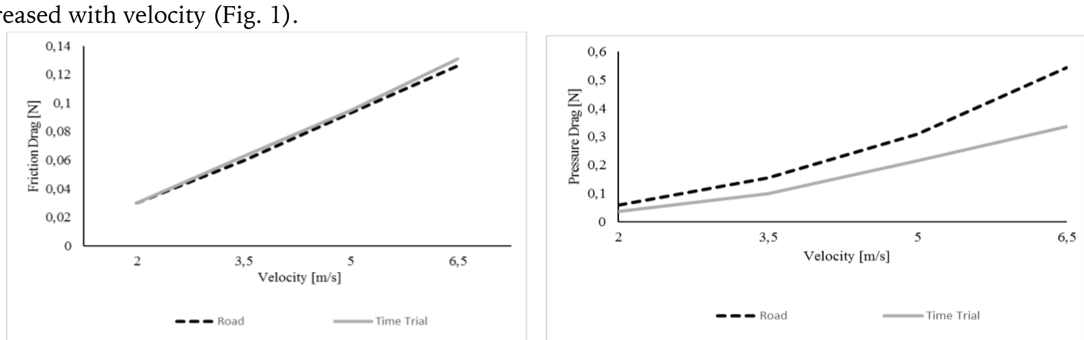
Computer Fluid Dynamics has been used by sports scientists aiming to improve the athlete's performance in sprinting events. In wheelchair sprinting, the athlete's velocity can reach up to 7m/s. The use of sport garments such as helmets may reduce the aerodynamic drag by 10%. Therefore, the aim of this study was to compare the friction and pressure drag between road and time trial helmets. A wheelchair racer (category T-52), European medallist in sprinting events and world championships finalist was recruited for this research. The subject wore a road helmet (LAS, Istron) and a time-trial model (LAS, Cronometro). The geometries were obtained by a 3D scan (Artec-L, Artec Group, Inc., USA). Fluent (Fluent, Inc., USA, New York) code allowed to compute numerical simulations applying a mathematical model to the fluid flow, in a created domain with discretized expressions of the Navier-Stokes equations. It solves the equations with a finite volume approach. The domain, created by a 3D mesh of subdivided cells, represented the fluid flow around the head and helmets. Realizable k-epsilon turbulence model was applied. The 3D mesh had more than 6 million cells for booth helmets domains and helmets angles of attack was 0º. The fluid flow velocity was set in inlet portion of the dome surface at 2m/s, with increments of 1.5 m/s up to 6.5 m/s. Typically the wheelchair racer will reach these range of speeds over a short distance event. Pressure and friction drag increased with velocity (Fig. 1).



(a) (b)

Figure 1. Friction (a) and Pressure (b) drag for road (dash line) and time trial (solid line) helmets at different speeds.

Pressure drag ranged from 0.059 N to 0.542 N and 0.036 N to 0.336 N, for road and time trial helmets respectively. Pressure drag was lower wearing the time trial helmet than the road one at all selected velocities. As far as friction drag is concern, it ranged between 0.03 N and 0.126 N, 0.03 N and 0.131 N, for road and time trial helmets respectively. The partial contribution of friction drag to total drag force ranged from 34-19% and 45-28%, for road and time trial helmets, respectively. The partial contribution of pressure drag was 28-49% and 55-72% for road and time trial models, respectively. Aerodynamic drag increases with velocity. The road helmet presented a lower friction drag and the time trial a lower pressure drag. The pressure drag was the main contributor to total drag, inducing a time trial helmet usage.

Applied biomechanics in competitive gymnastics: Brazilian scenario

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Biomechanics has much to contribute to the continued progress of gymnastics. Its use may sharpen the understanding of the techniques, suggest new skills and lead to the achievement of advanced performances. It may also help identifying and controlling circumstances that lead to accidents (Irwin & Kerwin, 2010). The aim of this study was to review the biomechanics studies conducted by Brazilian research groups concerning competitive gymnastics. The literature search was conducted using Pubmed, SciELO and Google Academic electronic databases. "Gymnastics" and "biomechanics" (English) and "ginástica" "e" "biomecânica" (Portuguese) were used as keywords. The identified reference lists in the articles, dissertations and thesis were considered. Searchers were also carried out from the Proceedings of the Scientific Conferences of the International Society of Biomechanics in Sports. Experimental biomechanical studies from 2000 to 2016 conducted by Brazilian research groups were included.

Table 1
Included rhythmic gymnastics studies with authors, main aim and variables.

Authors	Main aim	Variables
Szezerbaty et al. (2013)	To verify the fatigue influence on the low back muscles in postural stability	Centre of postural oscillation, Anterior-posterior velocity, Medium-lateral velocity
Guiotte et al. (2012)	To characterise the physic-functional profile related to postural stability and the gymnastics injury history	Centre of pressure oscillation mean velocity
Shigaki et al. (2013)	To evaluate posture balance between the dominant and contralateral lower limb during different balance tasks	Ellipse area of the centre of pressure, mean velocity, mean frequency of the centre of pressure oscillations

From the 18 included studies, 55.0 % were conducted from 2010 to 2016, which might be related to the onward Brazilian gymnastics performance in elite level events. Most of the researches have considered only the artistic gymnastics (50.0%). Rhythmic gymnastics corresponded to 33.33% of the included studies being three published in peer-reviewed journals (Table 1). One study has concerned about trampoline gymnastics. Kinematics and kinetics have been the two most common areas in the gymnastics biomechanics (72.22%). Brazilian research groups have focused on artistic gymnastics for kinematic and kinetic characterisation, which might be due to the ascendant gymnastics performance in elite events.

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Shigaki, L. et al. (2013). Comparative analysis of one-foot balance in rhythmic gymnastics athletes. *Revista Brasileira de Medicina do Esporte, 19*, 104-107

Szezerbaty, S. et al. (2013). The influence of fatigue of lumbar muscle in stability postural athletes of rhythmic gymnastics. *Manual Therapy, 11*, 546-550