



PHYSIOLOGICAL RESPONSES TO WATER FITNESS ACTIVITY:

A COMPARISON BETWEEN THE EFFECTS OF EXERCISE ON DIFFERENT WATER BIKES

Giacomini F.¹, Benelli P.¹, Ditroilo M.¹, Gatta G.², Fernández Peña E.¹, Lucertini F.¹, De Lillo F.¹, Del Sal M.¹, Trisolino G.¹, Stocchi V.¹.

¹Istituto di Ricerca sull'Attività Motoria, Università degli Studi di Urbino, Italy.

²Facoltà di Scienze Motorie, Università degli Studi di Bologna, Italy.

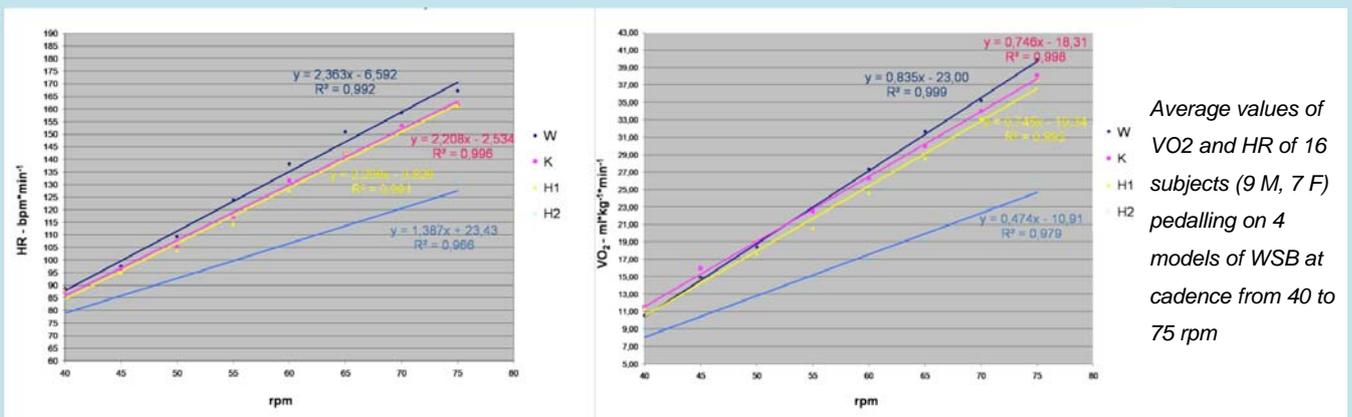
INTRODUCTION: Despite several studies investigated the acute effects of water immersion exercises performed on standard or modified cycle-ergometers, none of them has considered the effects of the stationary pedalling in water on bikes specifically used for fitness purposes. The aim of the present work is to compare oxygen consumption (VO_2) and heart rate (HR) during an incremental exercise, performed on four different models of water stationary bikes (WSB).

METHODS: Sixteen subjects, 9 males (M) (aged 31.2 ± 7.8 ; height 180.9 ± 7.8 cm, weight 80.2 ± 8.3 kg) and 7 females (F) (aged 31.3 ± 6.2 , height 163.1 ± 4.4 cm, weight 57.6 ± 3.2 kg), in water immersion to the hip, performed an incremental exercise pedalling for 8 steps, each lasting 2', from 40 to 75 revolution per minute (rpm) with an increase of 5 rpm at every step according to metronome beat, on 4 different WSB: 1) Waterfly (Waterfly, Regalbuto Italy) (W) equipped with four adjustable blades directly fixed on the bottom bracket; 2) Keo Aquabike Basic (Keo, Carasco, Italy) (K) with Flap Movement (2 plastic fins applied to the pedals); 3-4) Aqua Bike Professional (Hydrorider, S. Lazzaro di Savena, Italy), equipped with four adjustable blades and with (H1) or without (H2) adjunctive Resistance Kit (plexiglass elements fixed under pedals).



The resistance of the WSB, was set to obtain the maximum drag. The VO_2 ($ml \cdot kg^{-1} \cdot min^{-1}$) and the HR (bpm) were respectively measured by a portable K4b² gas analyzer (Cosmed srl, Rome, Italy) and Vantage NV heart rate monitor (Polar Electro Oy, Kempele, Finland).

RESULTS: VO_2 and HR (average of 2') in the last step (75 rpm) were respectively 39.82 ± 3.84 $ml \cdot kg^{-1} \cdot min^{-1}$ and 167 ± 18 bpm for W, 38.08 ± 4.47 and 162 ± 15 for K, 37.67 ± 4.83 and 161 ± 17 for H1, 25.96 ± 5.51 and 132 ± 22 for H2. Using the average measurement for each step, the regression lines of VO_2 and HR have been taken for each subject. The slope of the lines were compared by a paired samples t test (with Bonferroni correction) that showed significant differences in VO_2 between W and H2 ($p=.000$), K and H2 ($p=.000$), H1 and H2 ($p=.000$), in HR between W and H2 ($p=.001$), K and H2 ($p=.000$), H1 and H2 ($p=.000$). Moreover F showed higher average measurements both in VO_2 (+11%), and in HR (+7%) in comparison with M pedalling at the same rpm no matter which WSB is used.



Average values of VO_2 and HR of 16 subjects (9 M, 7 F) pedalling on 4 models of WSB at cadence from 40 to 75 rpm

CONCLUSIONS: i) the intensity of the effort on WSB, with similar rpm, can differ according to the technical characteristics of the specific equipment. ii) the higher VO_2 and HR, with similar rpm, in F compared to M, are probably due to the less muscle mass and higher % of fat mass and to the increasing effect of buoyancy in F. These preliminary results can give useful information in order to prescribe fitness exercises with WSB, according to subjects' characteristics, differences between the equipment and ACSM guidelines.

REFERENCES:

- Chen AA, Kenny GP, Johnston CE, Giesbrecht GG. Can J Appl Physiol. 1996, 21: 134-48
Costill DJ., Sports Med Phys Fitness. 1971, 11: 87-92