PERCEIVED EXERTION, TIME OF IMMERSION, AND PHYSIOLOGICAL CORRELATES IN ELITE SYNCHRONIZED SWIMMING DURING COMPETITION

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Introduction

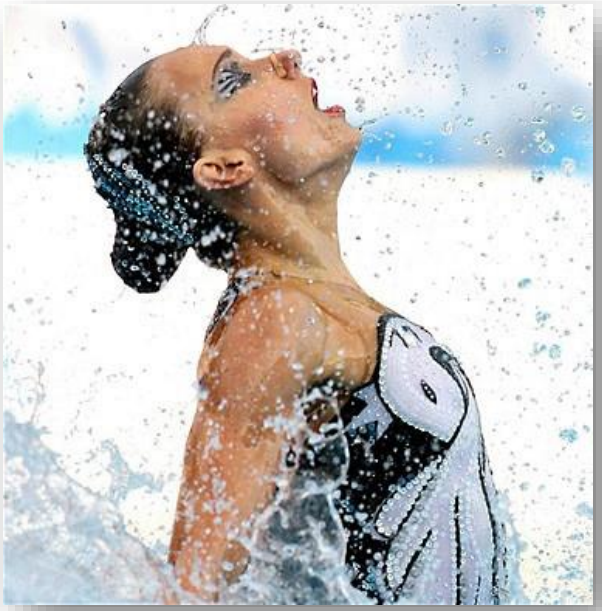
Synchronized Swimming

Introduction

- Difficulty to asses physiological parameters i
- Recent report on HR, lactate and RPE durin competition (Rodríguez-Zamora 2012)
- RPE seems a useful tool to monitor internal
- Distorting influence of hypoxia due to respiratory afferent input (Shephard et al. 1992)

Introduction

- Is RPE an appropriate tool to assess the internal load during solo and duet?
- Which parameters can best explain RPE during SS competitive routines?



Hypotheses

- RPE is influenced by duration and frequency immersion thus influencing the relationships between RPE and other load markers (HR and lactate)

- Diving bradycardia will modify swimmers' perceived exertion

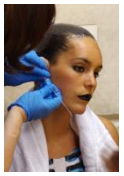
Subjects

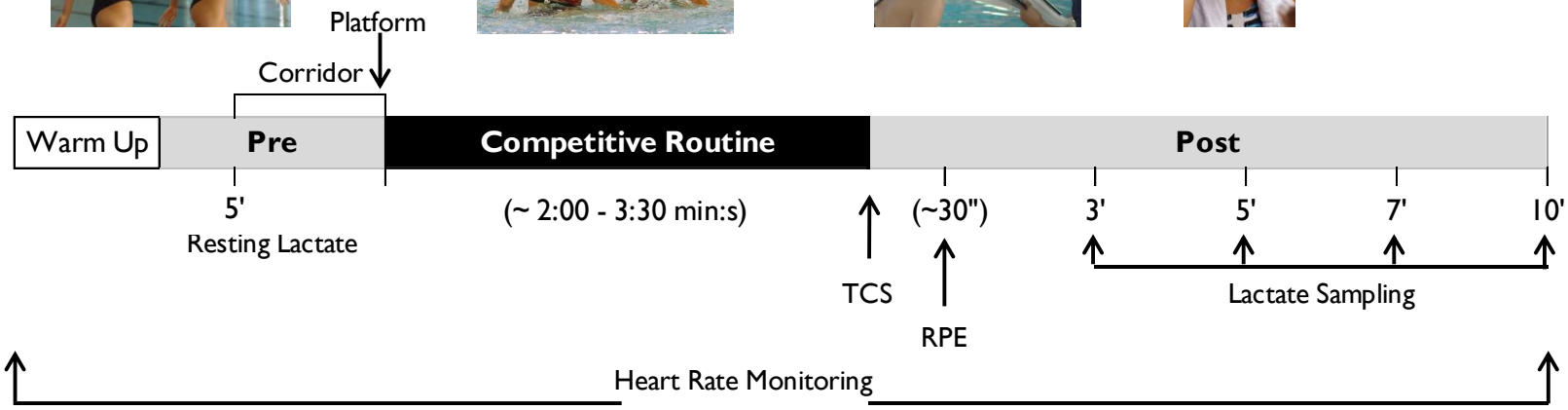
	n = 17
Height (cm)	165.1 ± 6.3
Body Mass (kg)	52.4 ± 5.5
Age (years)	17.9 ± 3.5
Training (h ·week^{-1})	37.4 ± 6.4
Sports- Specific practice (yrs)	9.8 ± 3.1

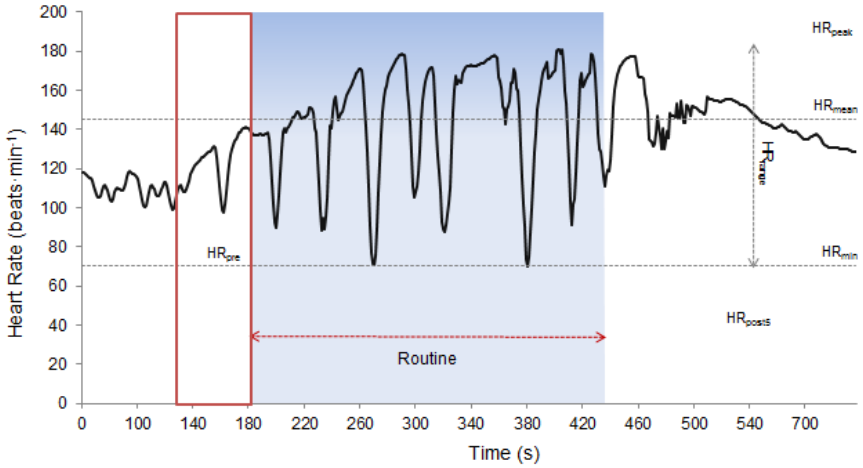
Values are mean ± SD

Design




Platform
Corridor
Warm Up
Pre
Competitive Routine
Post
5'
Resting Lactate
(~ 2:00 - 3:30 min:s)
TCS
(~30")
RPE
3'
5'
7'
10'
Lactate Sampling
Heart Rate Monitoring


Heart Rate (beats·min-1)
Time (s)
HRpeak
HRmean
HRrange
HRmin
HRpre
HRpost5
Routine
0
20
40
60
80
100
120
140
160
180
200
0
100
140
180
220
260
300
340
380
420
460
500
540
700

Method

Recorded images were decoded and registered with **free software** (LINCE, version 1.1)

Face-in

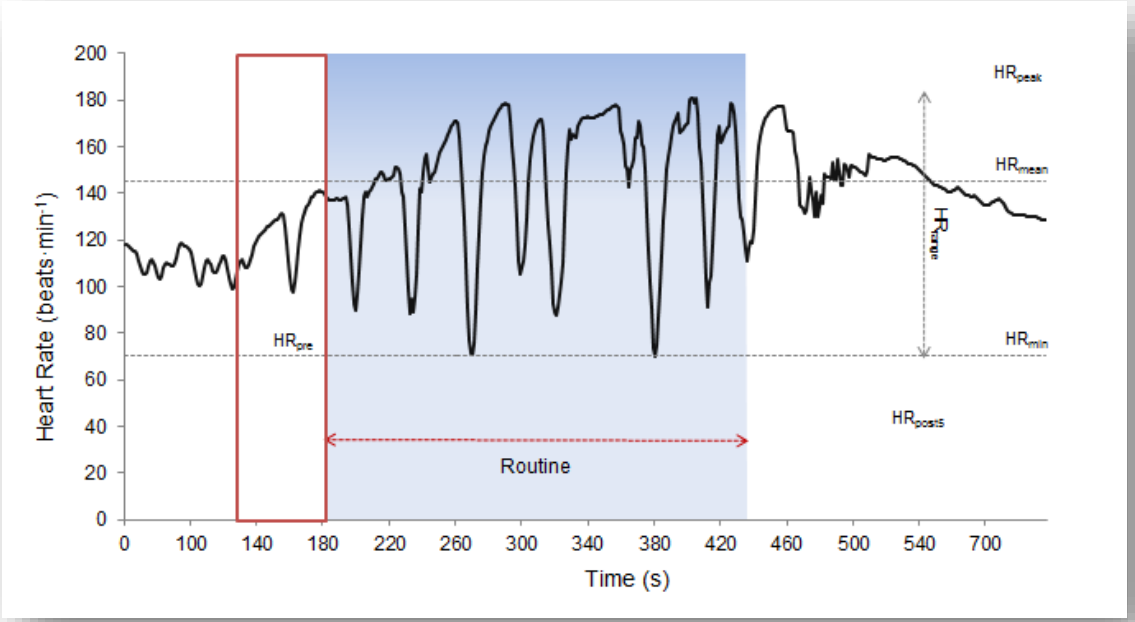
Face-out

	n = 17
NIM	Number of Immersions
TIM	Time of Immersion
MIM	Mean time of Immersion
RIM%	% of the routine immersed
IMmax	Maximum Immersion
NIM>10s	NIM longer than 10s
TIM>10s	TIM over 10s

Results

		Routines (n=30)
RPE		7.7 ± 1.1
Heart Rate	Pre	127.2 ± 12.0
	Min	87.7 ± 28.1
	Mean	157.1 ± 15.3
	Peak	191.1 ± 10.5
	Range	103.4 ± 27.2
	$Post_5$	103.0 ± 13.5

Values are mean ± SD



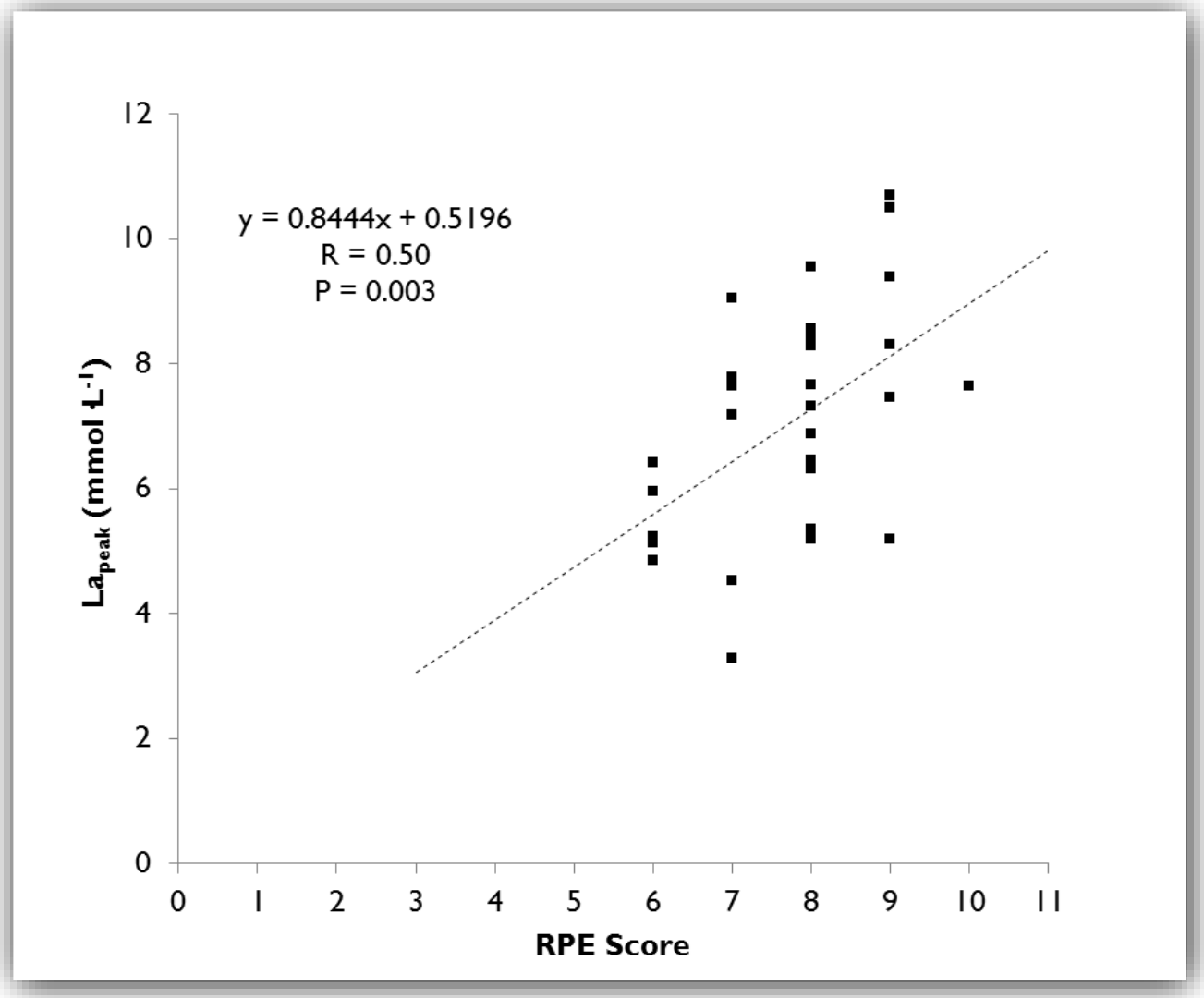
Immersion parameters

	Routines (n=30)
Lapeak (mmol · L^{-1})	7.0 ± 1.8 *
NIM (times)	24.4 ± 6.9 *
TIM (s)	100.1 ± 18.8 *
MIM (s)	4.3 ± 0.9
RIM% (duration)	61.2 ± 6.0
IMmax (s)	20.6 ± 4.1
NIM>10s (times)	4.1 ± 1.3 *
TIM>10s (s)	61.1 ± 18.0

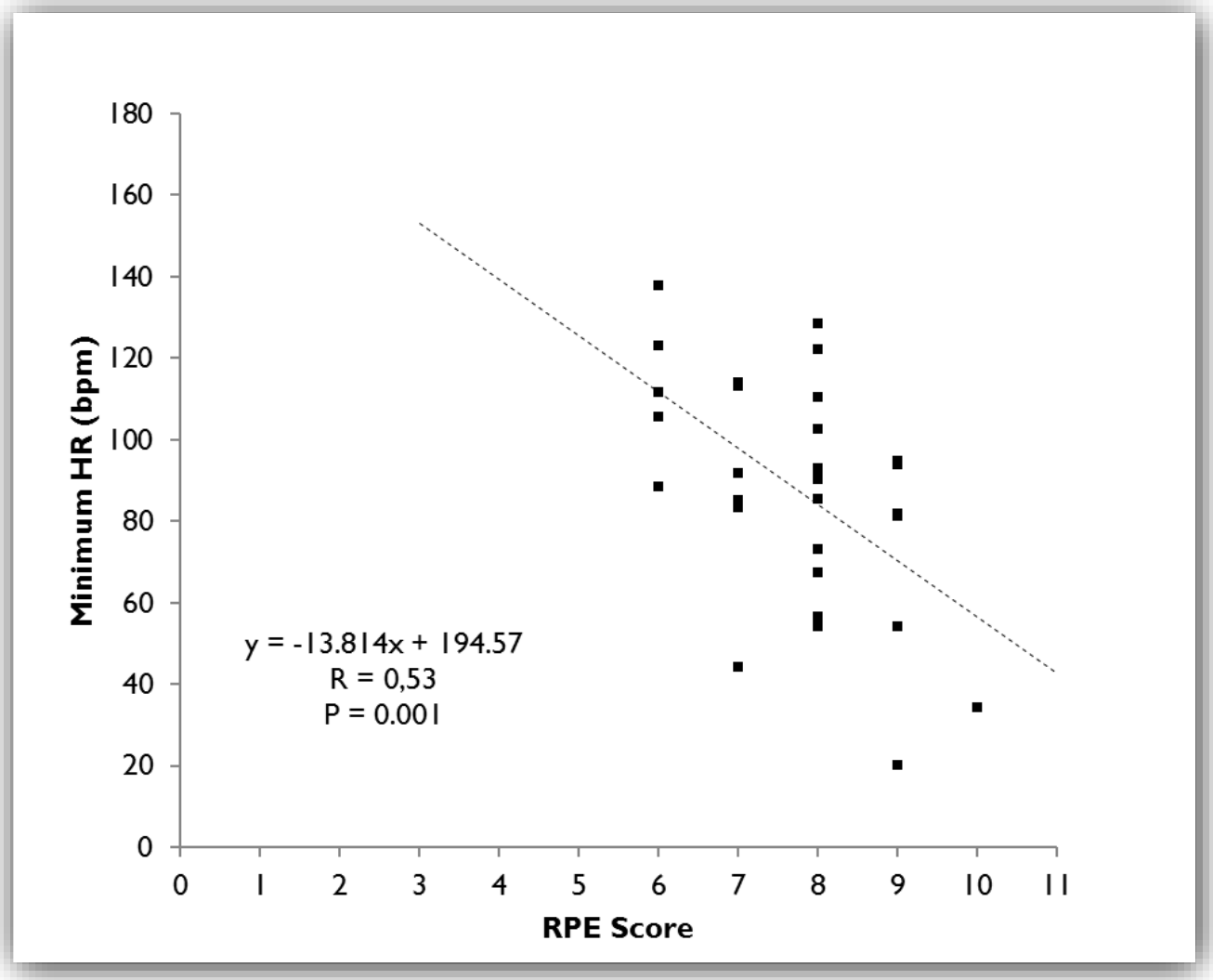
Values are mean ± SD.
* Significant differences among routines (TS, FS, TD, FD)

- Moderate La_{peak} suggesting
  –low activation of glycolysis (Brooks 1991)
  –specific metabolic adaptations (Smith 1988)
- Free routines and duets (2:20–3:30 *vs.* 2-3 min:s) imply
  –a higher number of immersions (NIM>10s)
  –for longer time (TIM>10s)
- This is consistent with previous reports during training (Homma 1994, 1999)

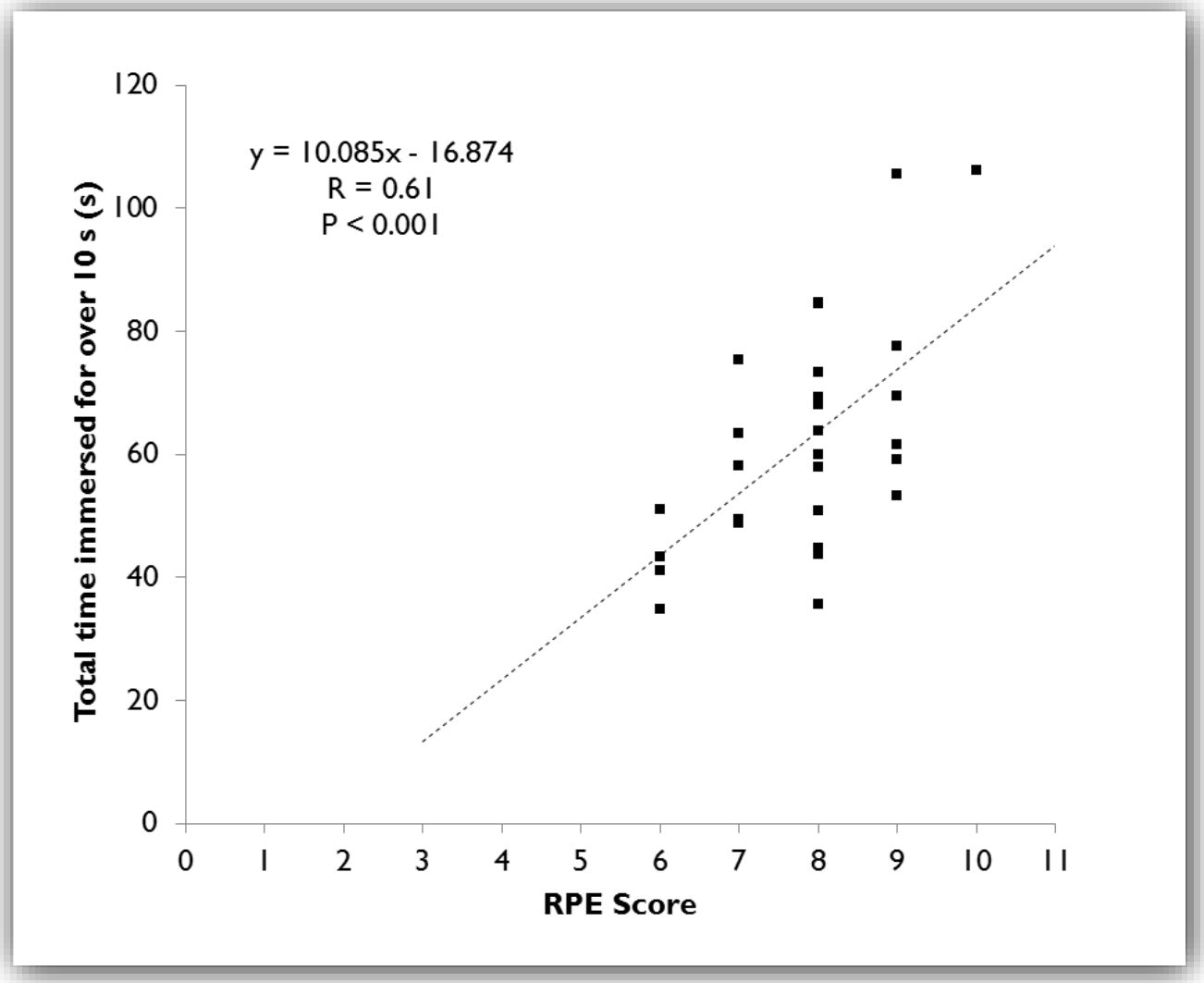
RPE score *vs.* lactate



RPE score *vs.* Minimum Heart Rate



RPE score *vs.* Immersion



MLR in Estimating RPE

- Hierarchical multiple linear regression (MLR) model
- Four variables explained 62% RPE (adj. R_m^2=0.62; P<0.001):

  NIM>10s
  HR_{min} and HR_{post5}
  La_{peak}

  $RPE = 4.23 + 0.03\ TIM>10s + 0.02\ HR_{post5} - 0.01\ HR_{min} + 0.09\ La_{peak}$

- NIM10 s and HR_{min} reflects the influence of long immersions and the subsequent bradycardia
- HR_{post5} and La_{peak} may reflect a training adaptation

Conclusions

- CR-10 RPE scale used independently is not a good tool for monitoring internal load when peak lactate or HR alone are used as criterion variables

- Prolonged and frequent immersions and intense exercise explain changes in RPE

- Cardiorespiratory factors seem to provide a relatively greater neural input as compared to metabolic factors

Thank you.

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