

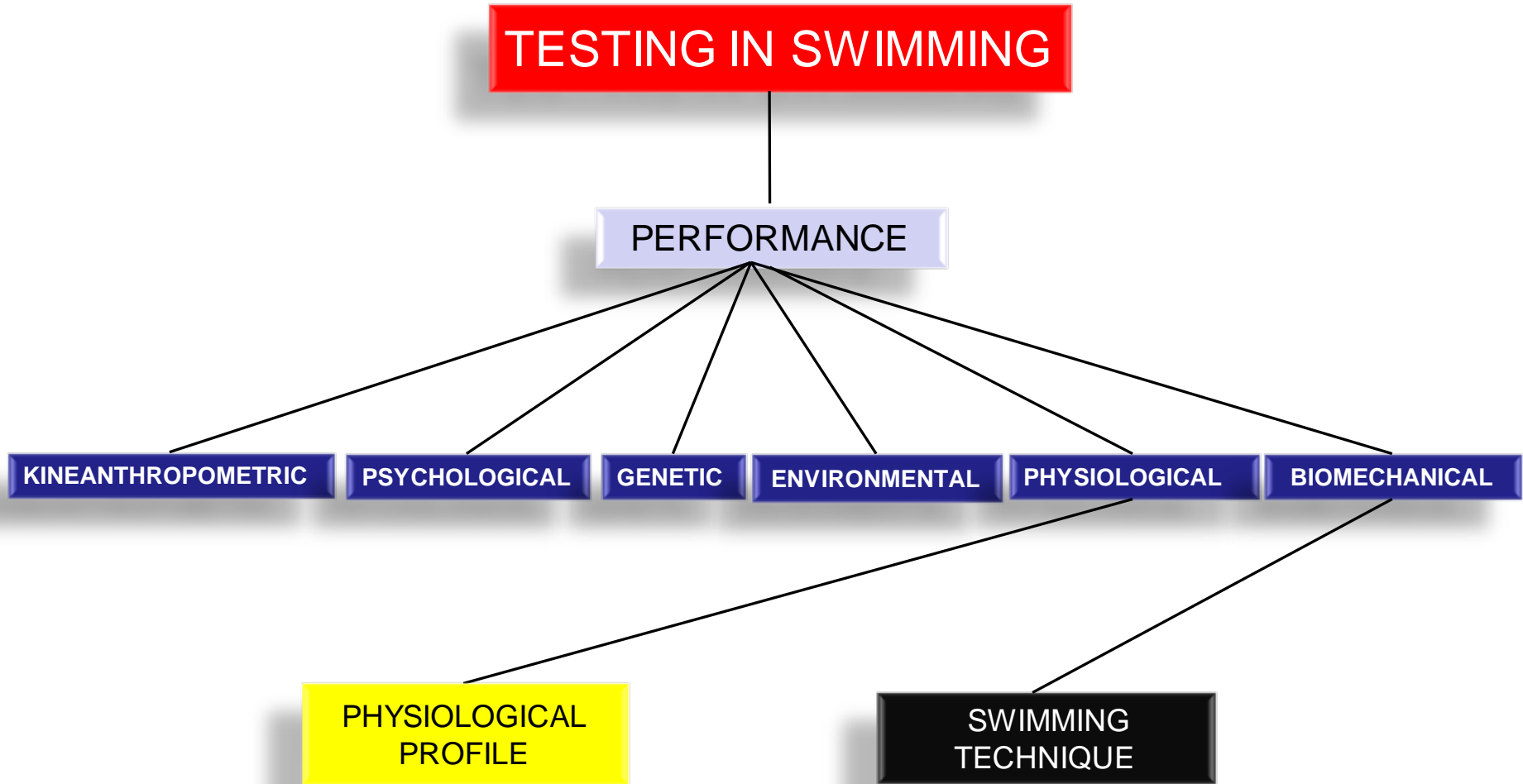
# Effects of different protocol step lengths on efficiency and arm coordination in front crawl



K. de Jesus, K. de Jesus, A. Abraldes, J. Ribeiro, J. P. Vilas-Boas, R. Fernandes

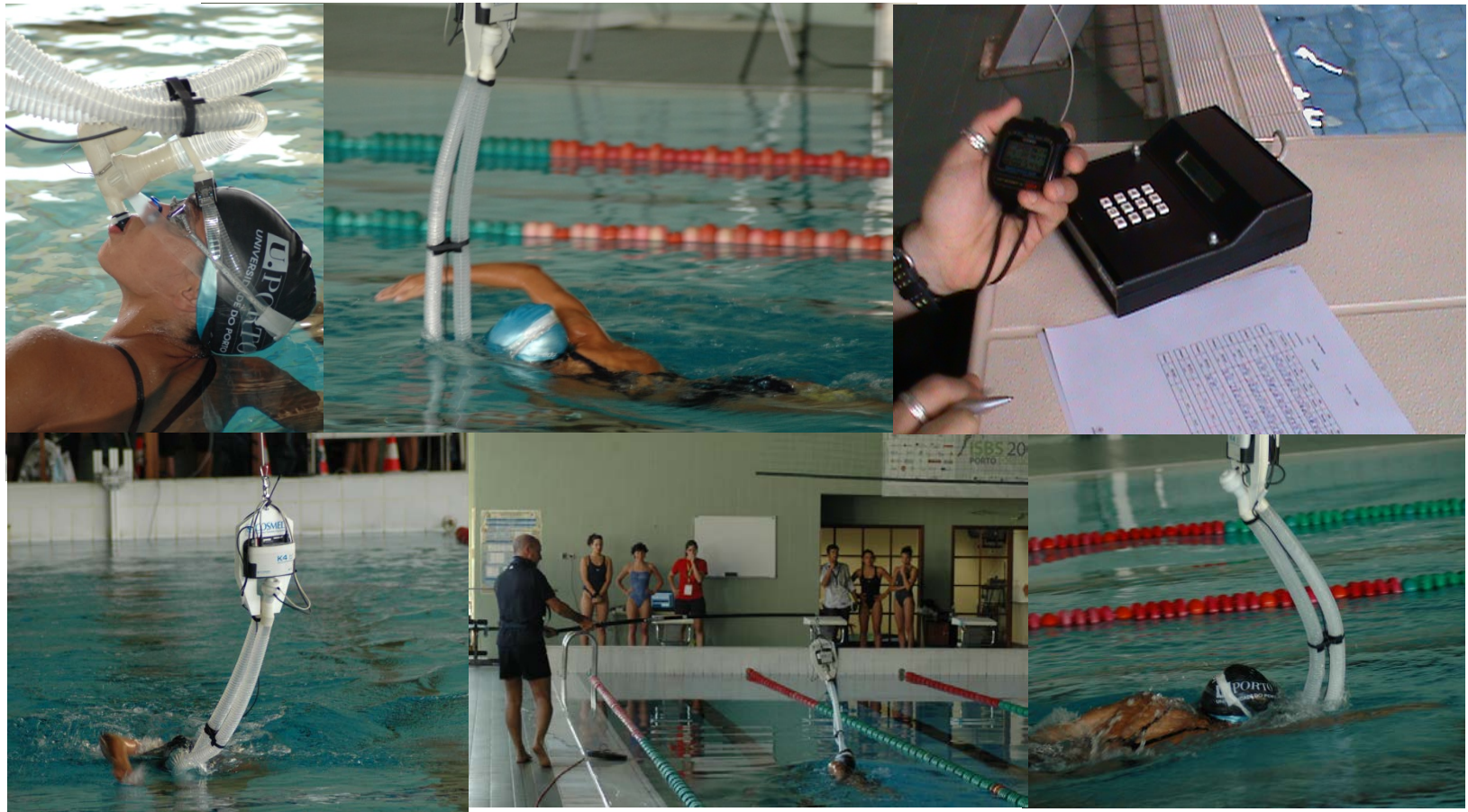
May 1, 2014

Australian Institute of Sport, Canberra, Australia



*Fernandes et al. 2011. Int J Sports and Med, 32, 1-7.*

# Incremental and Intermittent Swimming Exercise



de Jesus et al. 2014. *Int J Sports and Med* (in-press).

However...

Are the 200 m step length  
more accurate to represent  
blood lactate and oxygen  
uptake kinetics ?



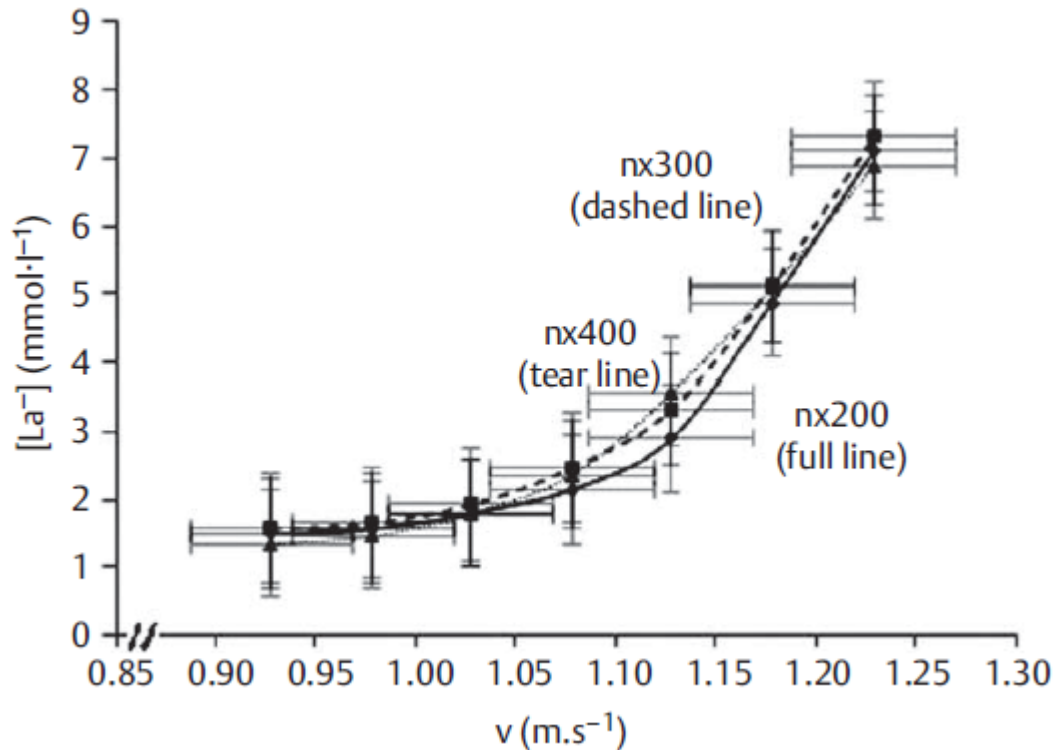
## Effects of Stage Duration in Incremental Running Tests on Physiological Variables

*Kuipers, H et al. (2003). International Journal of Sports and Medicine, 24, 486-491.*

The validity of incremental exercise testing in  
discriminating of physiological profiles in elite runners

*Arrese, A.L et al. (2011). Acta Physiologica Hungarica, 98, 147-156.*

# Recent Findings for [La<sup>-</sup>]



Adapted from Fernandes et al. 2011. *Int J Sports and Med*, 32, 1-7.

# Recent Findings for VO<sub>2</sub>

## 200 m

Subjects	breath-by-breath	5s	10s	15s
Median±IQR	53.23±2.21 <sup>a, b, c, d</sup>	52.13±3.14 <sup>c, d</sup>	51.64±3.31	51.15±3.26

## 300m

Subjects	breath-by-breath	5s	10s	15s
Median±IQR	52.89±3.13 <sup>a, b</sup>	51.67±2.80	51.88±2.77	51.25±2.99

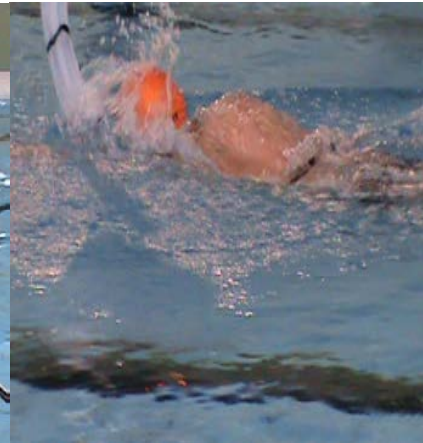
## 400 m

Subjects	breath-by-breath	5s	10s	15s
Median±IQR	51.39±2.81 <sup>a, b</sup>	51.64±2.90 <sup>a, b</sup>	50.93±3.30	50.46±3.19

*Adapted from Fernandes et al. 2012. Int J Sports and Med, 33, 1010-1015.*

# Objective

To compare incremental and intermittent protocols with different step lengths to observe eventual changes in technique related parameters.



nx200, nx300 and nx400m

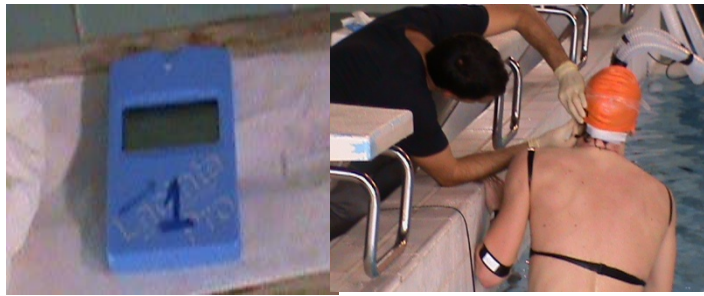
Eleven national  
level swimmers  
(n=11)

30s resting period  
and 0.05m/s inc  
until exhaustion

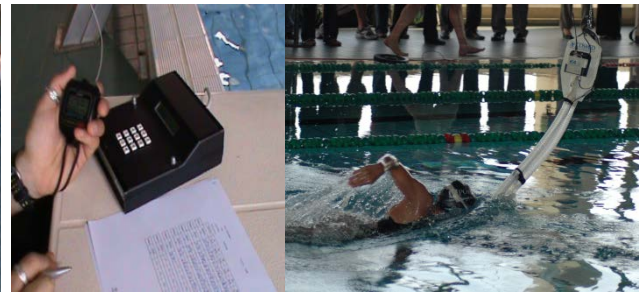
best performance 400m  
minus  
7 increments



K4 b2 and Aqua Trainer Snorkel,  
Cosmed , Rome, Italy



Lactate Pro, Arkay, Inc,  
Kyoto, Japan

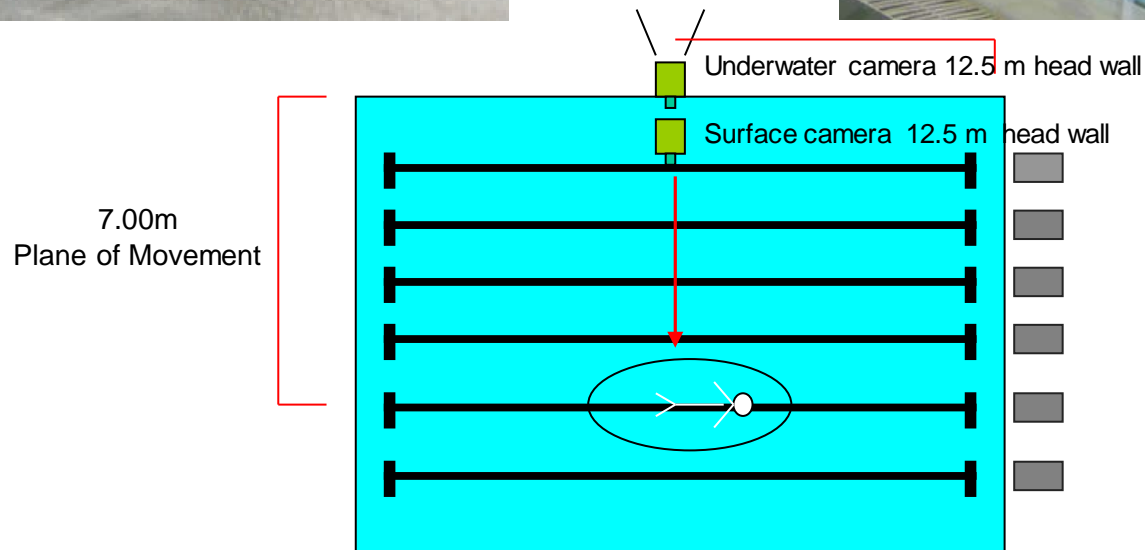


TAR.1.1, GBK-electronics,  
Aveiro, Portugal

*de Jesus et al. 2014. Int J Sports and Med (in-press).*

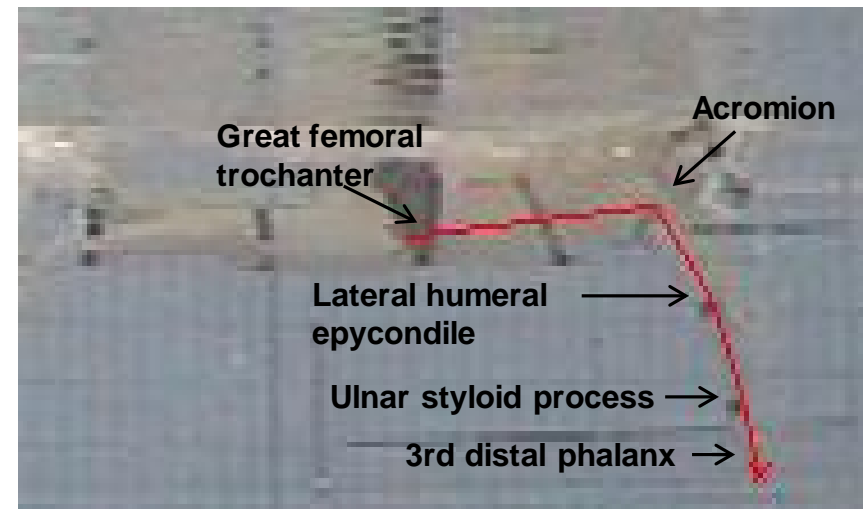


# Kinematic Assessment

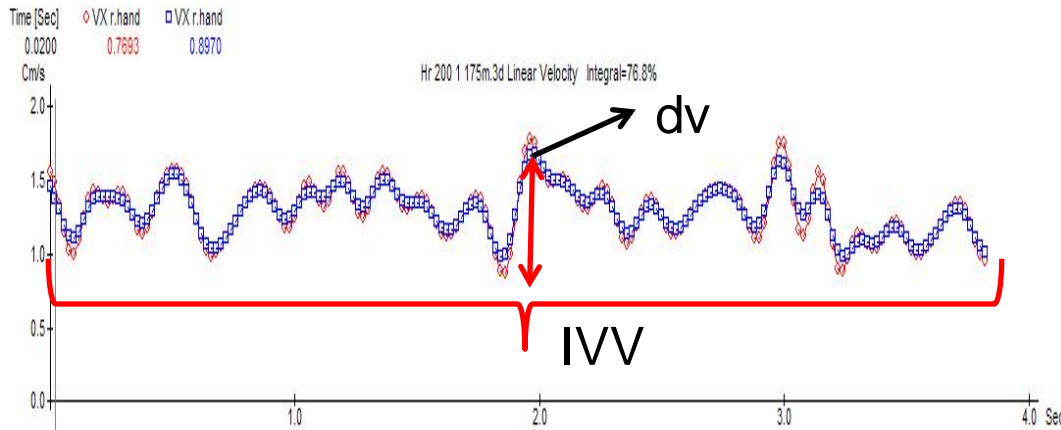


# Data Analysis

- ✓ APAS System (Ariel Dynamics, USA)
- ✓ Zatsiorsky & Seluyanov's model, adapted by de Leva, 1996
- ✓ Nine anatomical landmarks



# Efficiency and arm - coordination parameters

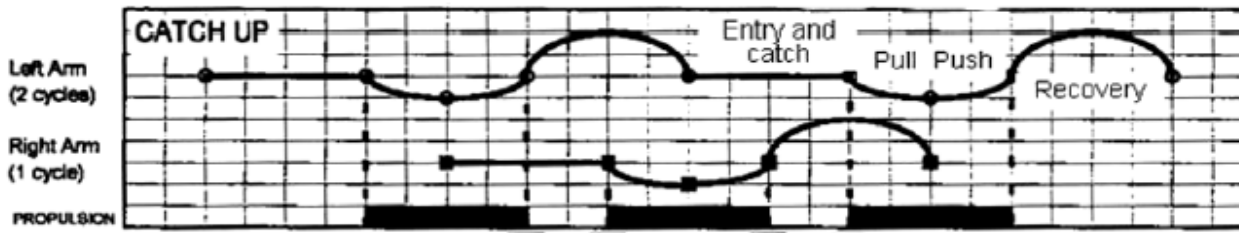


Figueiredo et al. 2012. *Int J Sports Med*, 33(4):285-290.

$$np = \frac{v^2}{u^2}$$

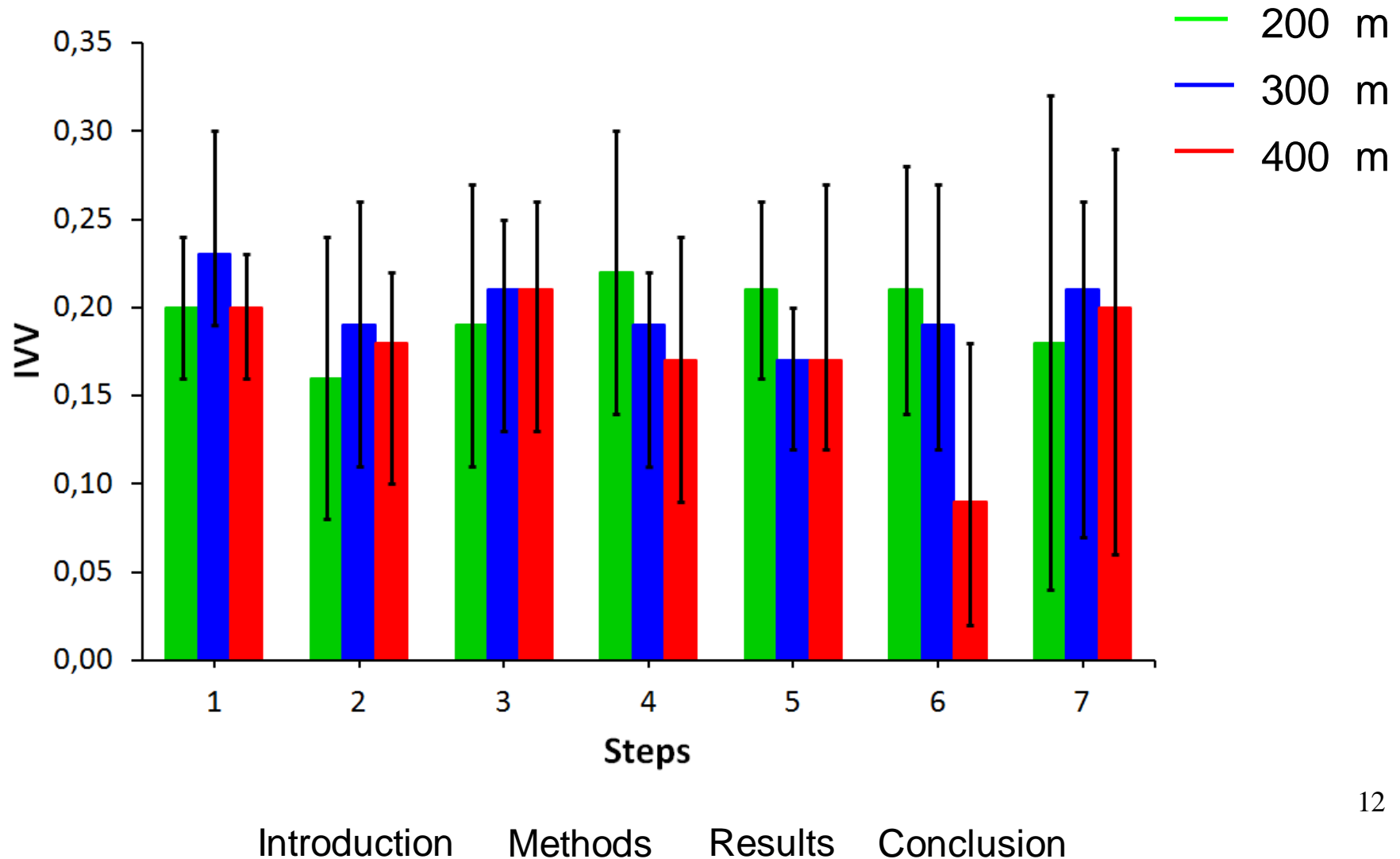
Zamparo et al. 2005. *Eur J Appl Physiol* 94:697-704.

IdC

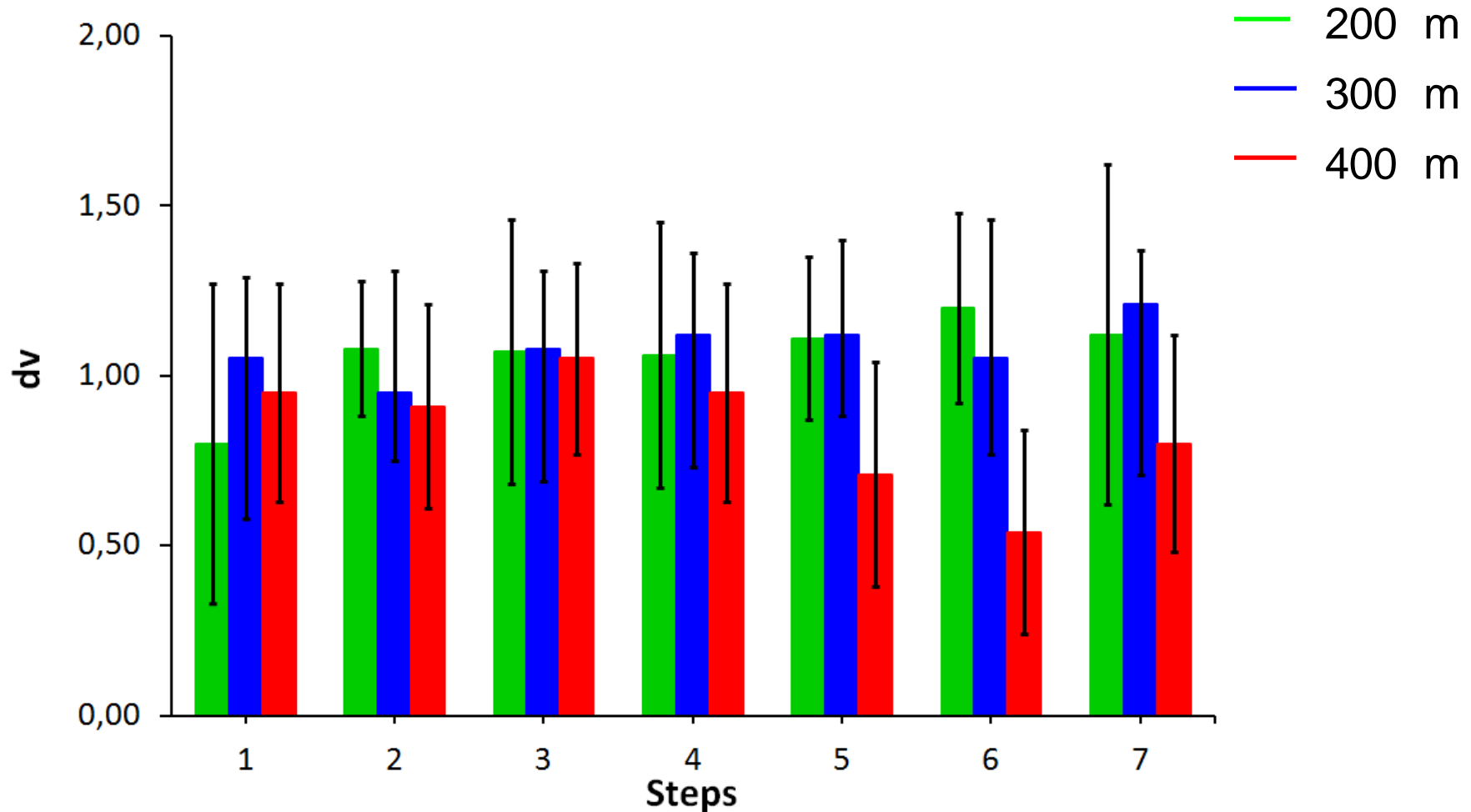


Chollet et al. 2000. *Int J Sports Med*, 21(1):54-59.

# Efficiency (IVV)



# Efficiency (dv)



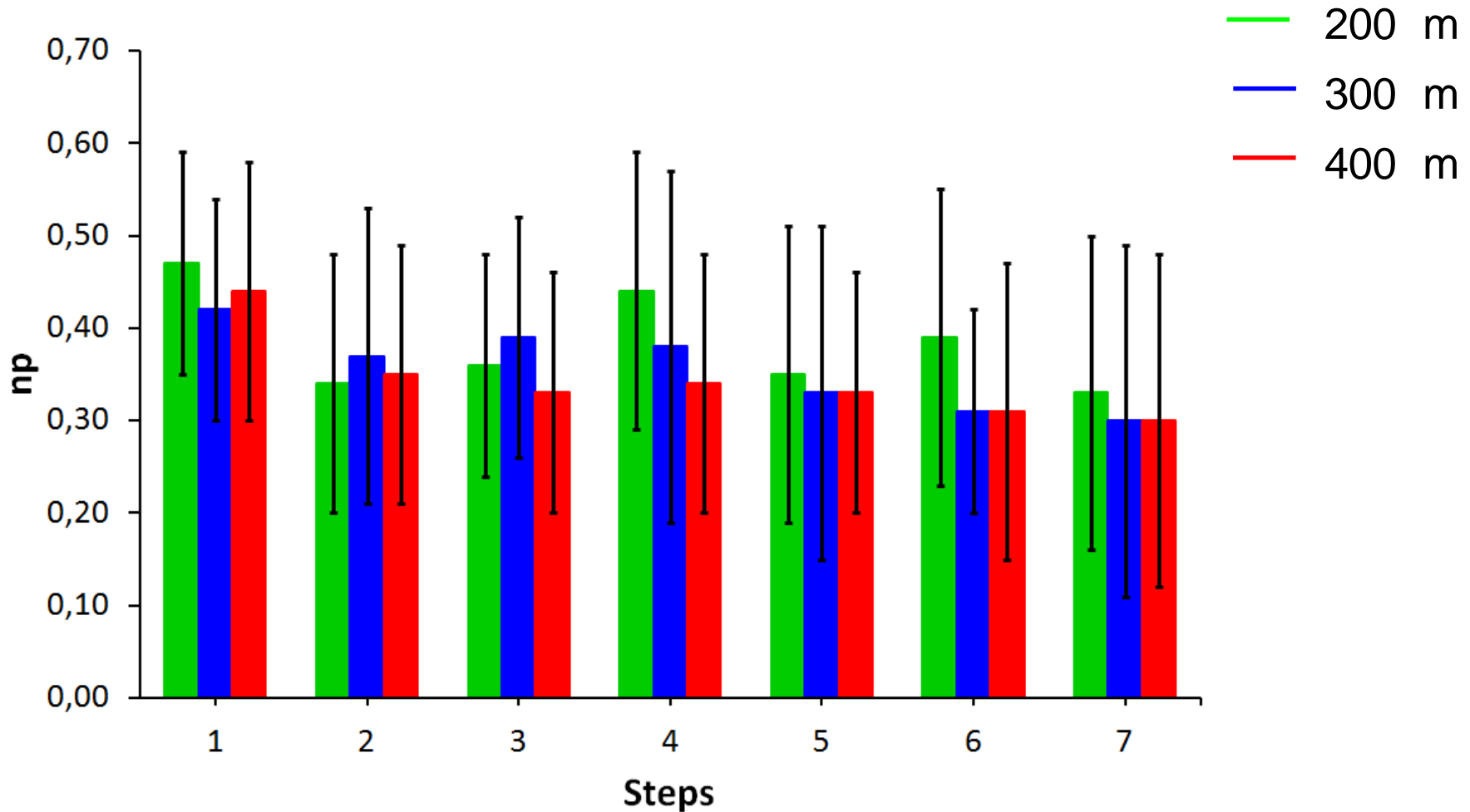
Introduction

Methods

Results

Conclusion

# Efficiency (hp)



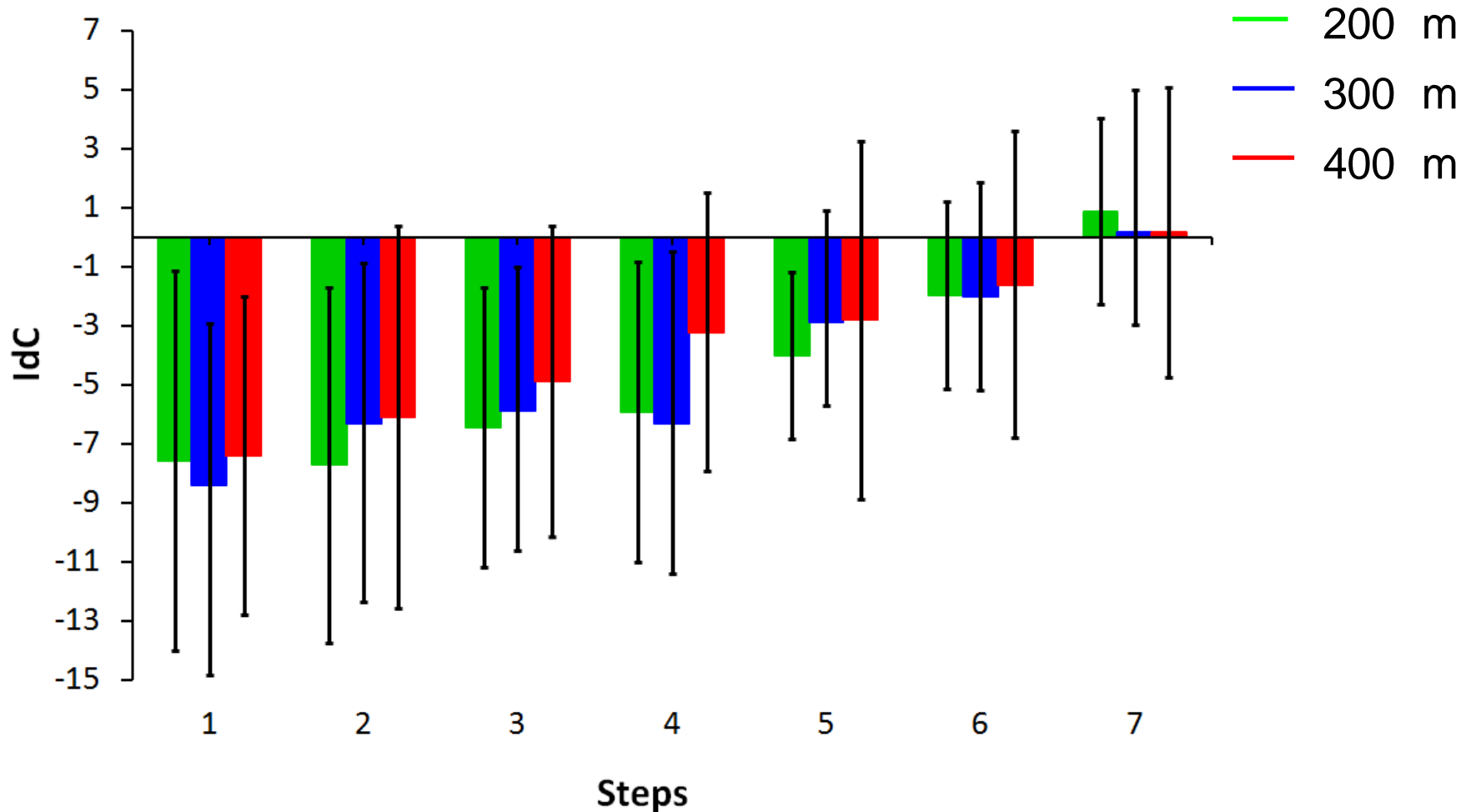
Introduction

Methods



Results

Conclusion

# Arm Coordination (IdC)



## 200, 300 and 400 m

- ✓ No meaningful differences for efficiency and arm-coordination parameters .
- ✓ 200 m  advantage for researchers, coaches and swimmers.
- ✓ 200 m  bioenergetical and biomechanical evaluation.



# Thank you for your attention!

## Acknowledgments:



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# FCT

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