# RED

## SynchroProject II: Alto rendimiento y salud en mujeres de natación artística

# Physiological Responses in Artistic Swimming

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Consejo Superior de Deportes

SYNCHRO project 2

RFEN AQUATICS

CAR CENTRE D'ALT RENDIMENT

ÖREBRO UNIVERSITET

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grceib Grup de Recerca en Ciències de l'Esport INEFC Barcelona

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# INTRODUCTION

# Introduction

50% of the time is spent underwater (Homma, 1994)

Competition is a challenging situation that

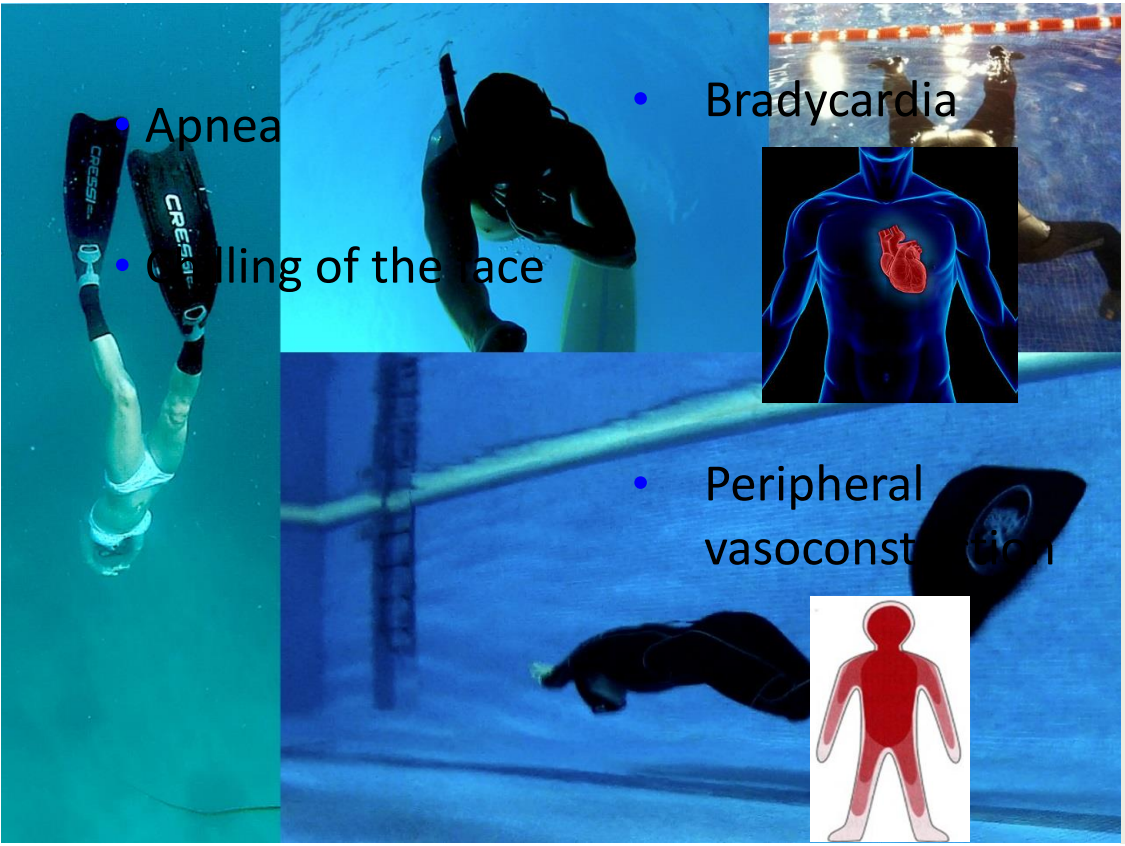
higher psycho-physiological responses (M. Viru et al.,

Methodological difficulties in assessing physiological parameters in AS (Poole, Crepin et al. 1980; Figura, Cama et al. 1993; Yamamura, Zushi et al. 1999; Bante, Bogdanis et al. 2007)

# Introduction

## The diving response

| Stimuli | Response | Function |
|---|---|---|
| • Apnea<br>• Cooling of the face | • Bradycardia<br>• Peripheral vasoconstriction | • Centralization of blood to brain and heart<br>• Oxygen Conservation<br>• Energy restriction in the heart |



# AIMS

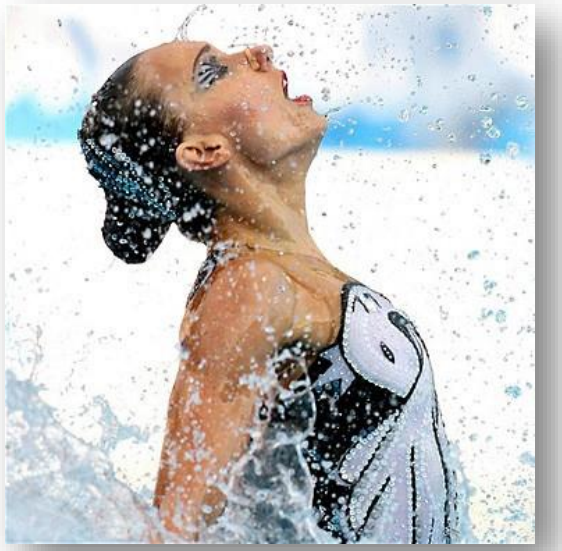
# Aims

- What is the physiological response in elite synchronized swimmers during competition?

- Which physiological parameters can best explain competitive performance?

# Aims

- Is there any difference between comp and training?



- Is RPE an appropriate tool to assess the internal load during solo and duet?

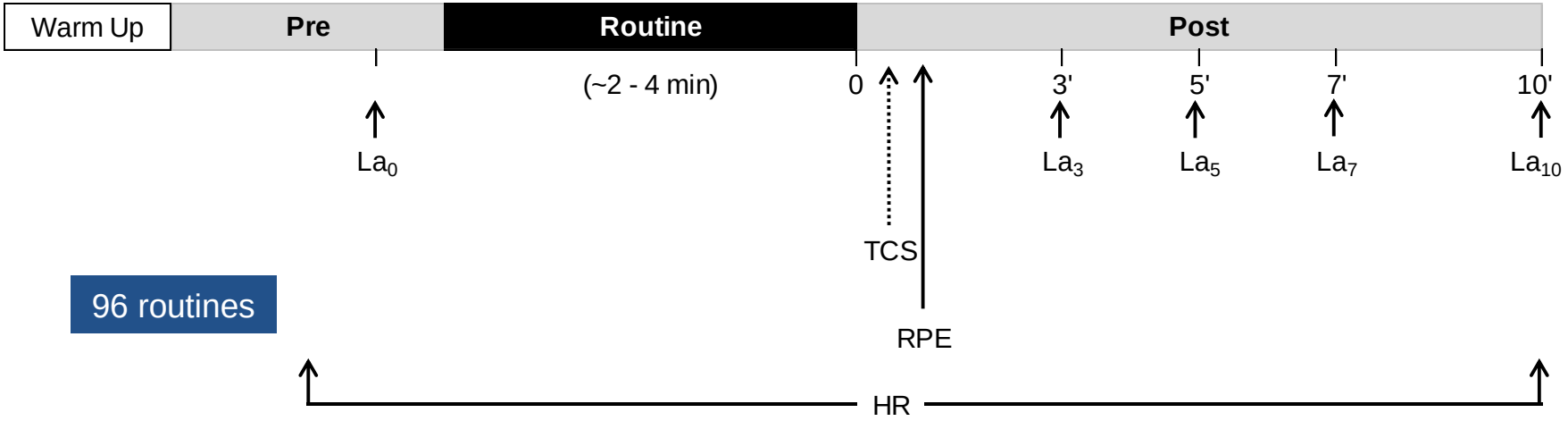
# METHOD

# Procedures

Study I | Study II | Study III

n = 34



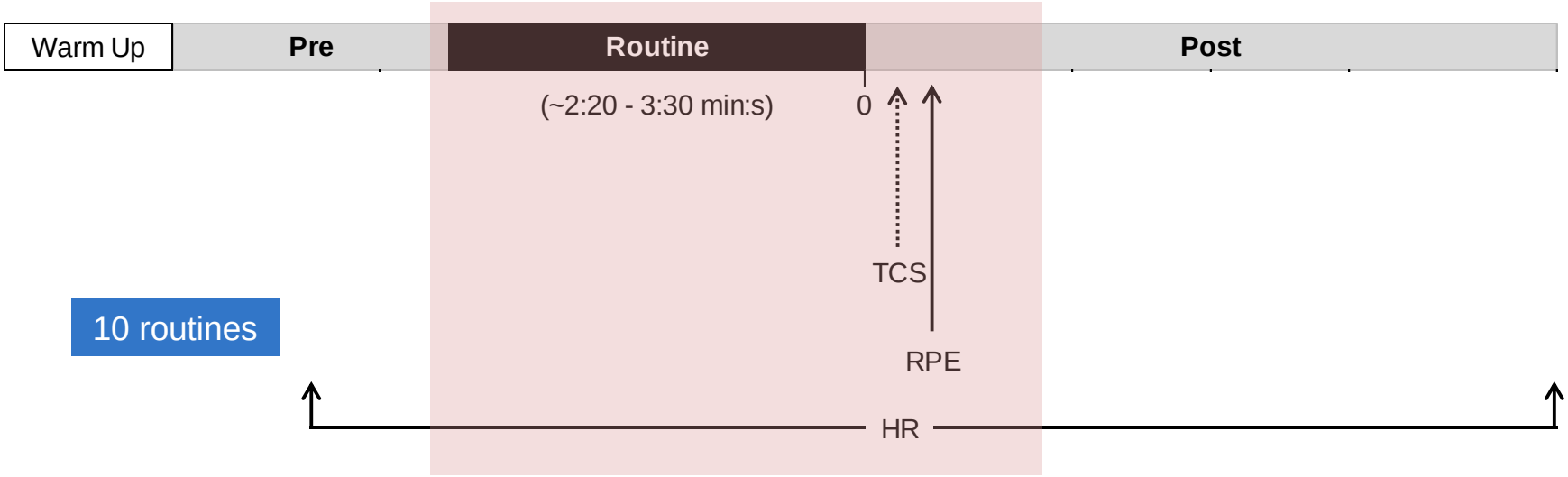




96 routines

# Procedures

Study I | **Study II** | Study III

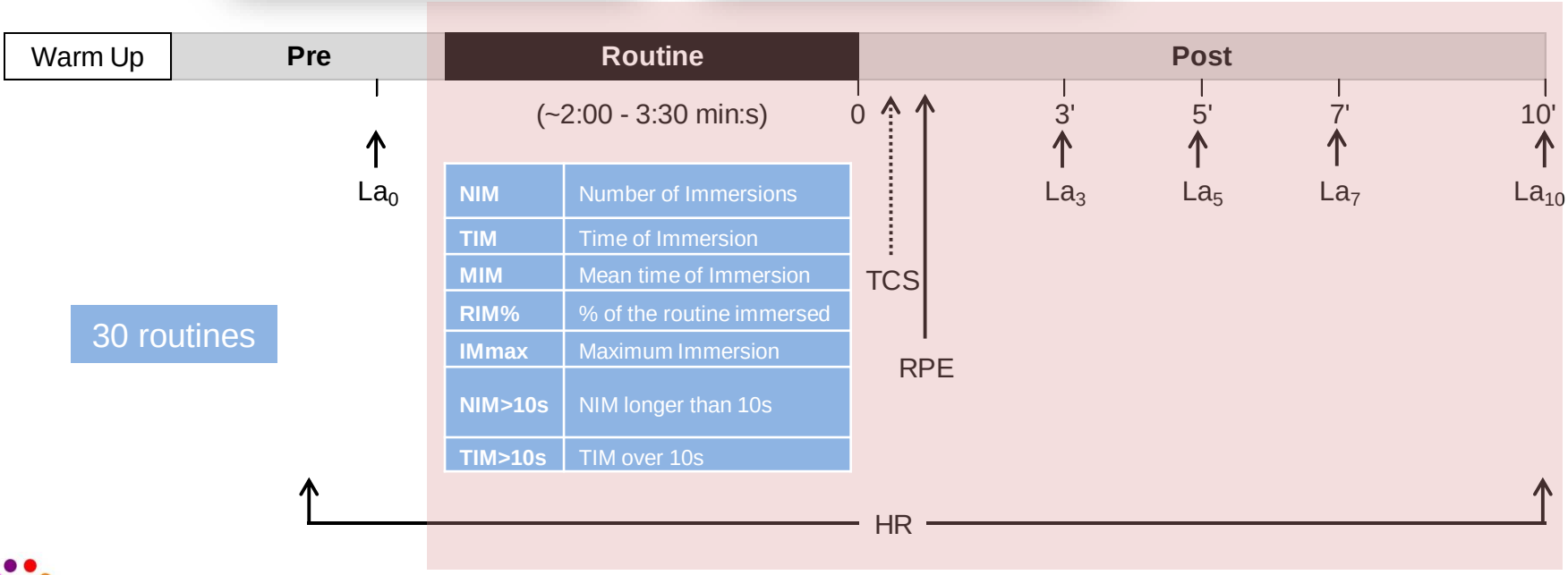
**n= 10**



# Procedures

Study I | Study II | Study III

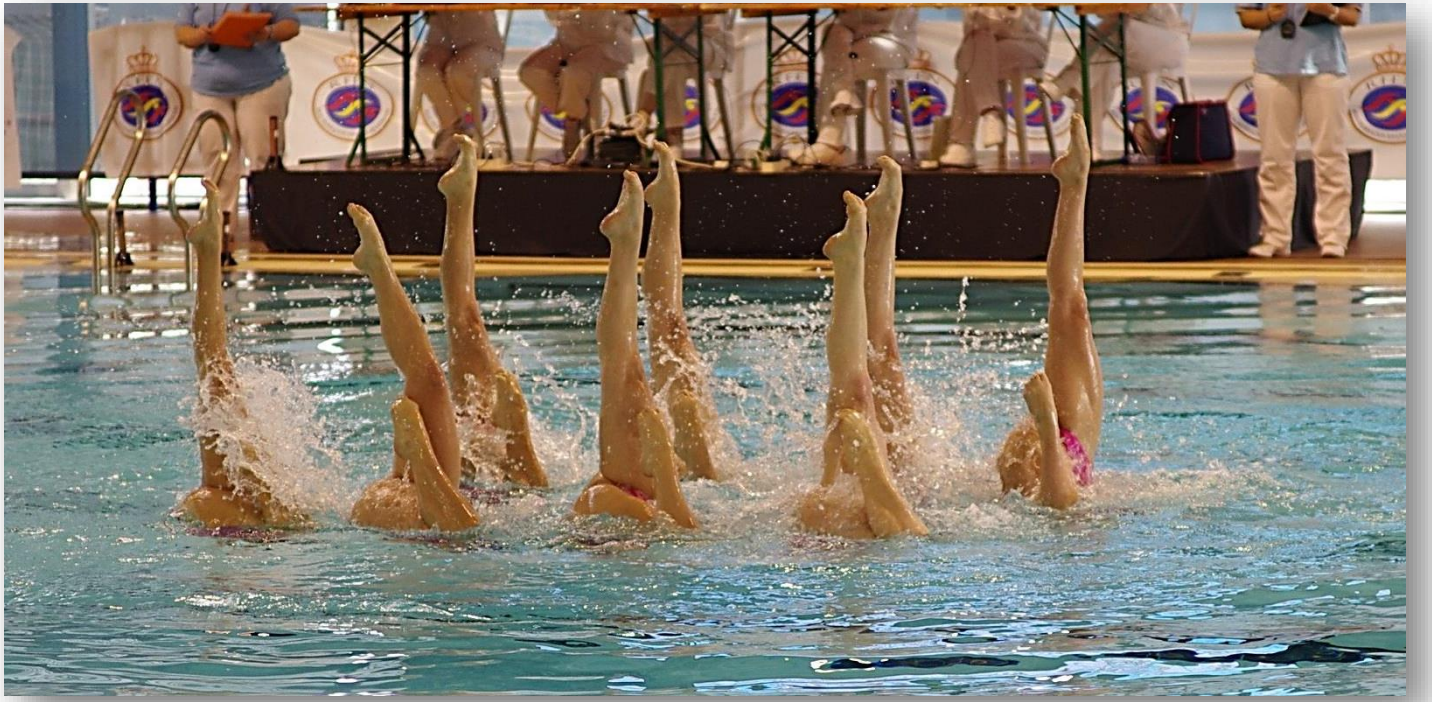
n=17




| | |
|---|---|
| **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 |

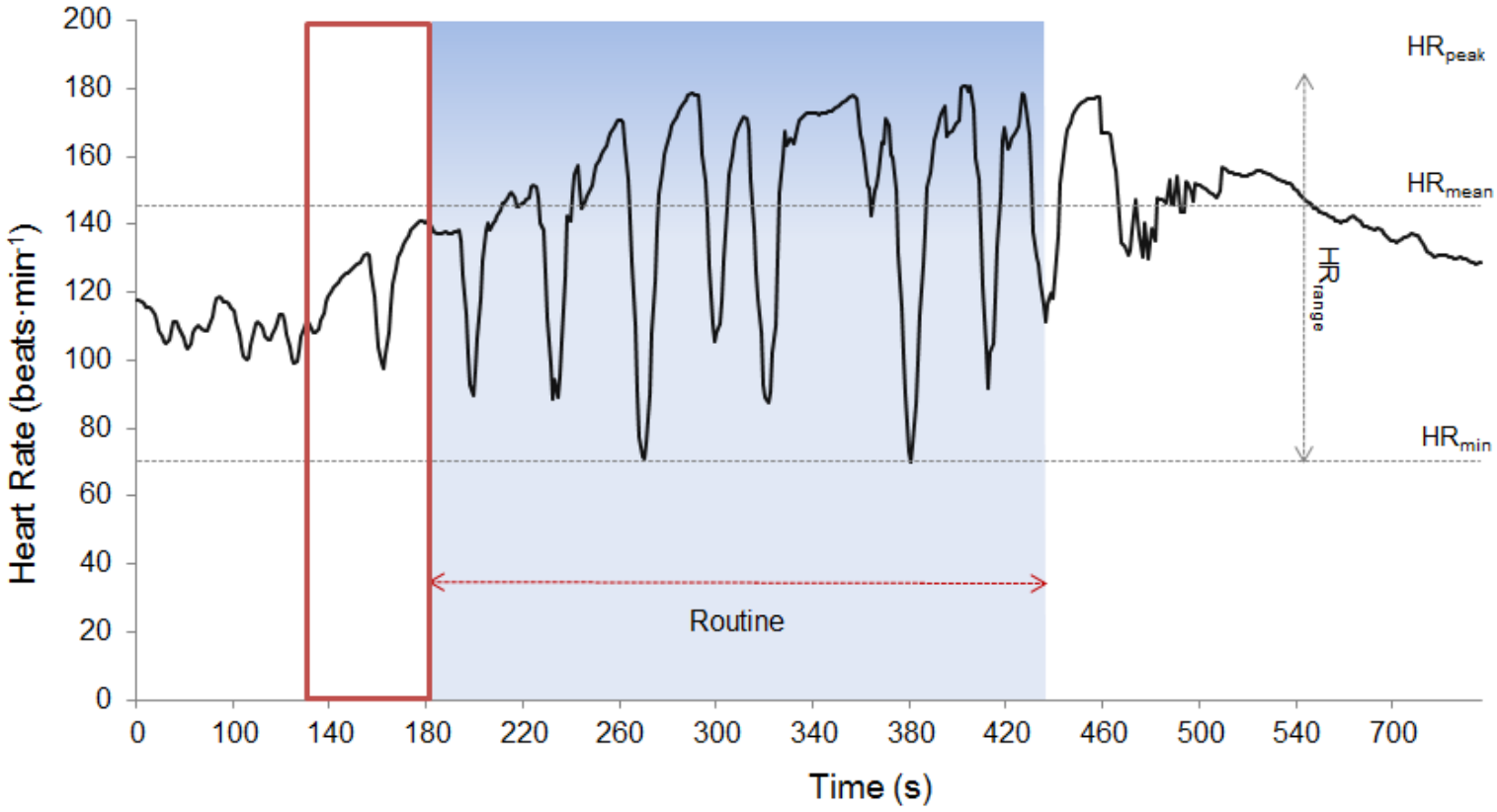
30 routines

# RESULTS



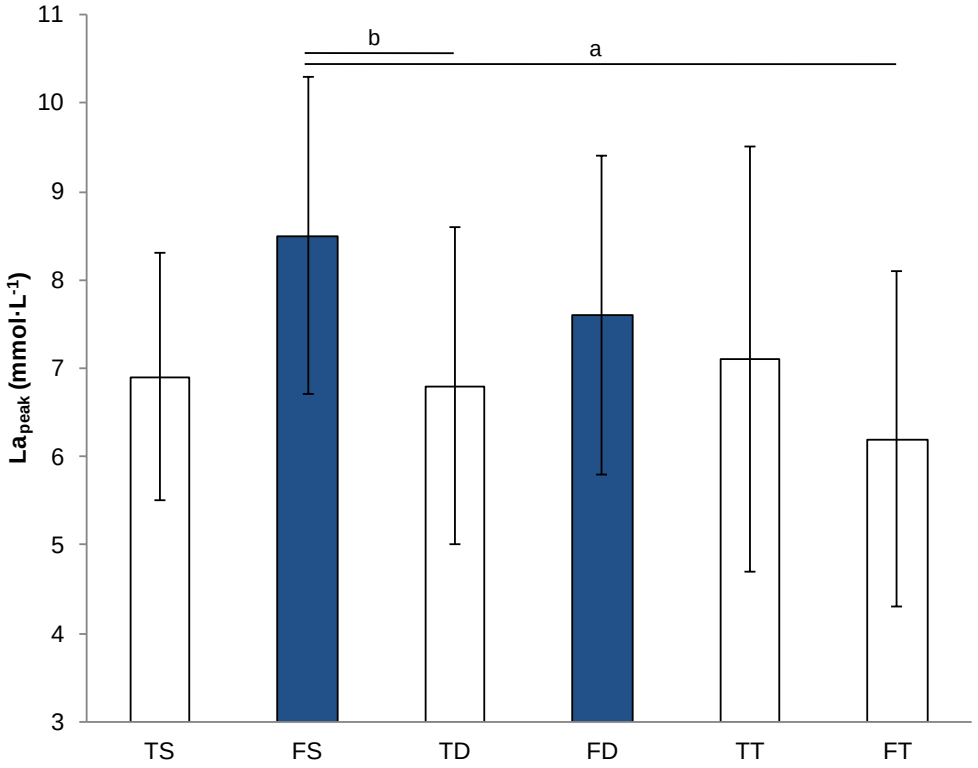
# Study I

## Heart Rate Response



# Study I

## Lactate

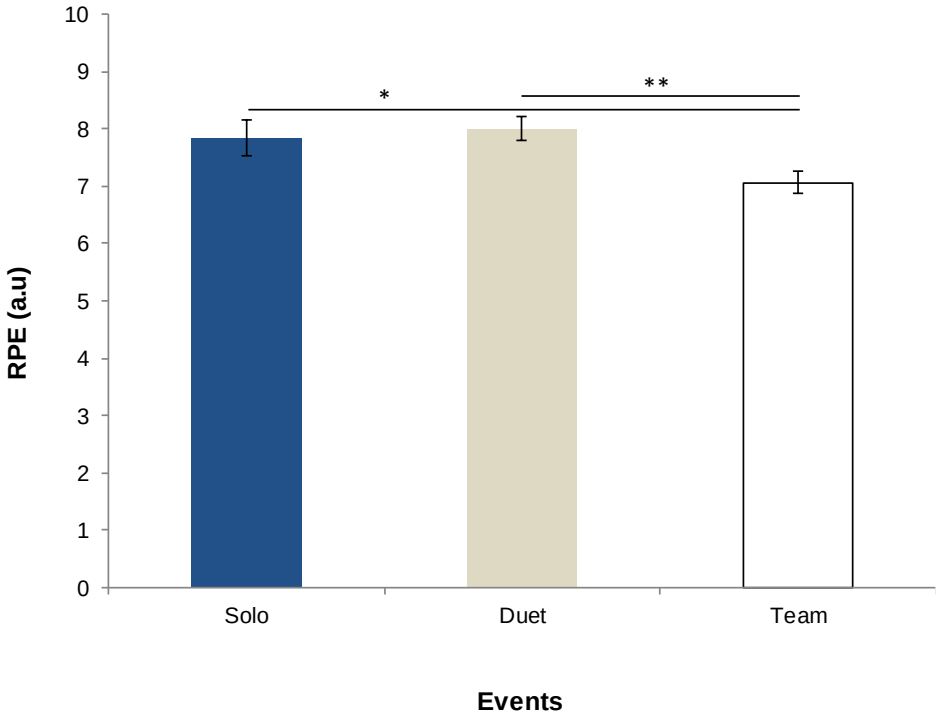



Prolongation of oxidative metabolism in parallel with anaerobic glycolysis (Brooks 1991, Shagatay 2010)

Specific metabolic adaptations (Chatard 1999, Emhoff 2013, Smith 1988, Yamamura 2000)

# Study I

## Rating of Perceived Exertion



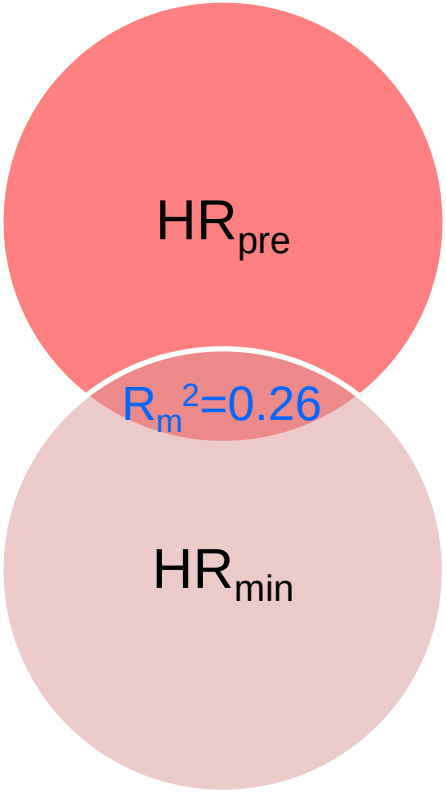

Mean RPE scores ranged from 6.6 (TT) to 8.1 (FD)

Routines were executed under similar conditions (music, exercise duration, water temperature, etc.)

# Study I

## Predicting competitive performance

Higher skill level (?)




Influence of immersion

Explained **26%** of the variability in AS performance

# Study III

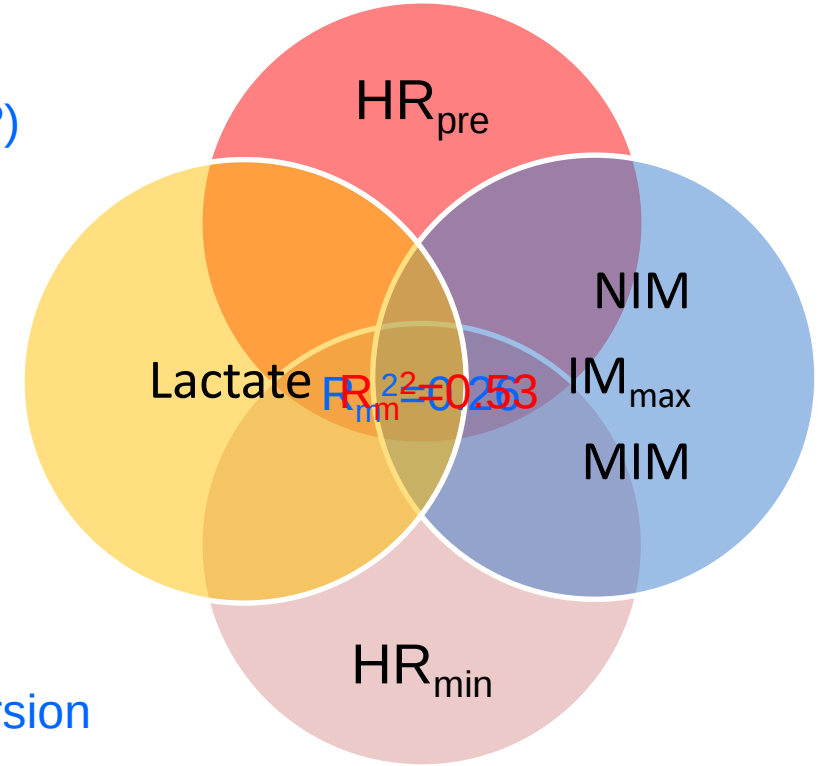
## Predicting competitive performance

Study III

Higher skill level (?)

Possible training adaptation (?)

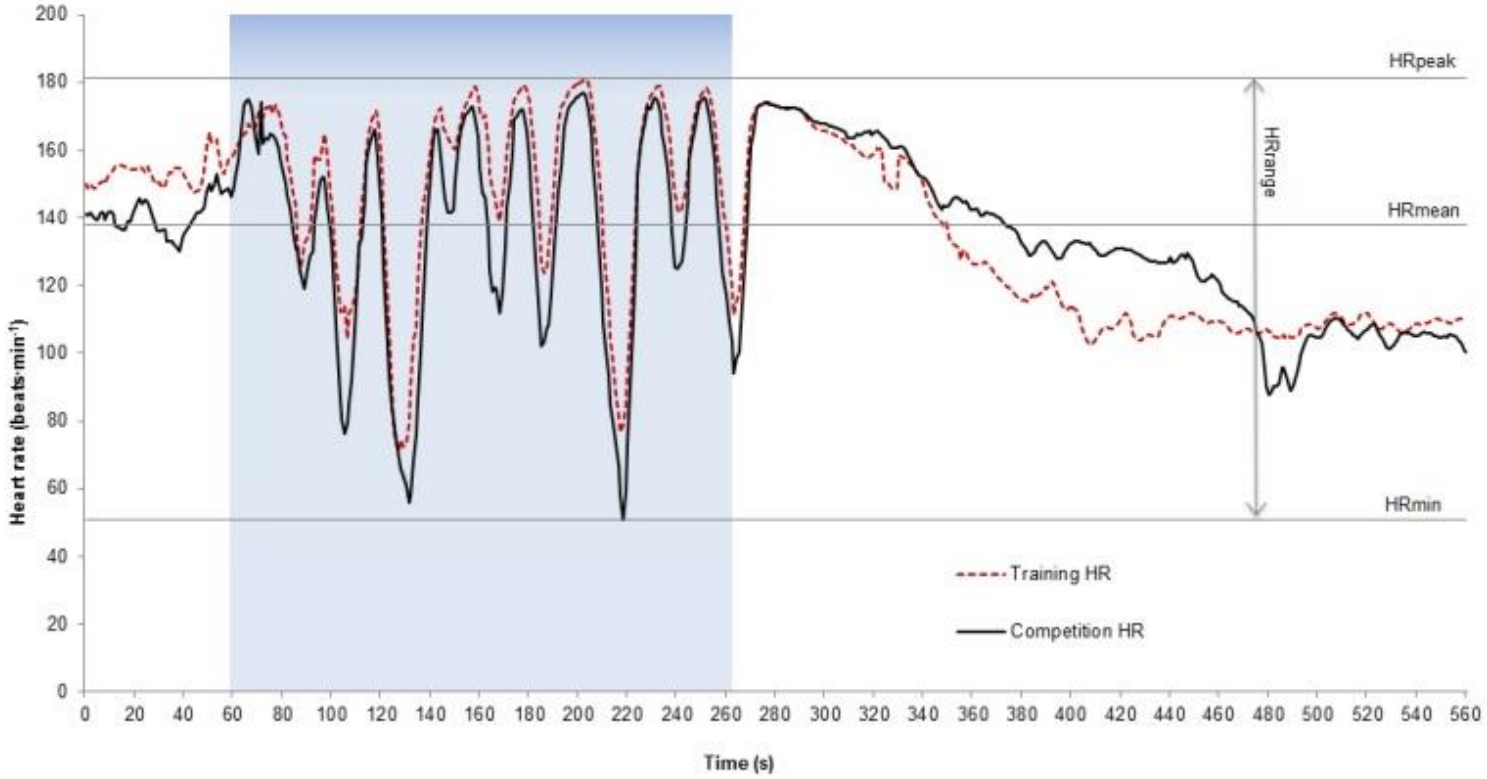
Influence of immersion




explained 53% of the variability in AS performance

# Study II

## Heart Rate Response



# Study III

## Immersion parameters

| | TS | FS | TD | FD |
|---|---|---|---|---|
| **NIM (times)** | 17.1 ± 1.9 | 26.4 ± 2.2 | 21.0 ± 1.3 | 33.3 ± 2.1 |
| **TIM (s)** | 82.7 ± 3.9 | 105.3 ± 4.6 | 85.0 ± 2.8 | 125.1 ± 4.5 |
| **MIM (s)** | 5.0 ± 0.3 | 4.2 ± 0.3 | 4.1 ± 0.2 | 4.1 ± 0.3 |
| **RIM%** | 69.5 ± 2.3 | 57.9 ± 2.6 | 58.7 ± 1.7 | 60.7 ± 2.4 |
| **IMmax (s)** | 19.6 ± 1.8 | 23.1 ± 2.1 | 18.8 ± 1.3 | 22.6 ± 1.9 |
| **NIM>10s** | 2.9 ± 0.5 | 4.0 ± 0.6 | 3.9 ± 0.3 | 5.2 ± 0.6 |
| **TIM>10s (s)** | 45.2 ± 7.0 | 63.7 ± 8.4 | 53.5 ± 5.0 | 76.6 ± 8.2 |

Values are mean ± SD.

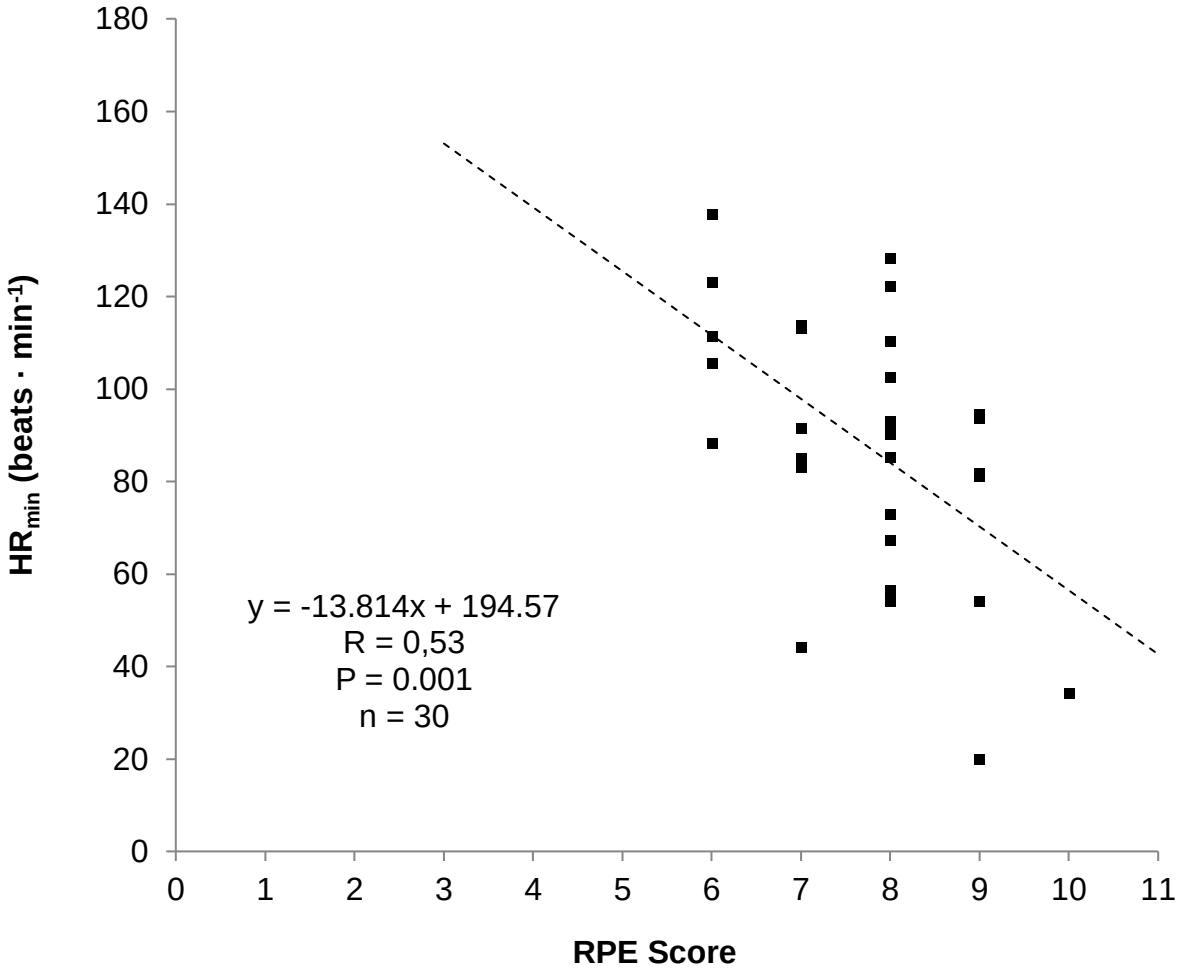
Free routines and duets (2:20–3:30 *vs.* 2-3 min:s) imply

- a higher number of immersions
- for longer time

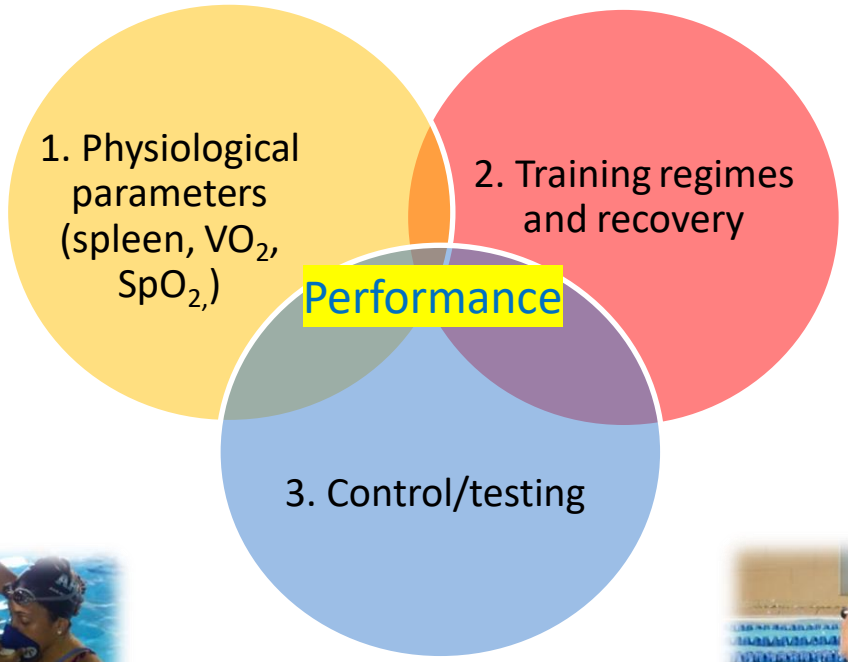
This is consistent with previous reports during training (Homma 1994, 1999)

# Study III

## RPE correlates



# Future perspectives in AS




# Tack!

ÖREBRO UNIVERSITET

# RED

## SynchroProject II: Alto rendimiento y salud en mujeres de natación artística

*Esta presentación forma parte de la RED SynchroProject II: Alto rendimiento y salud en mujeres de natación artística (Referencia: **SYNCPROJECT** - 99784), que ha sido financiada por el Consejo Superior de Deportes (Ministerio de Educación, Formación Profesional y Deportes) a través del programa REDES de investigación en ciencias del deporte 2024*