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Positive-negative response model of exercise on performance

Fred Grappe

Head of Performance - FDJ Cycling Team
University of Franche Comte, EA4660, C3S Health & Sport Department, Besançon, France

Culture Sport Santé Société

U-SPORTS Université de Franche-Comté

Équipe Cycliste FDJ

During effort the cyclist passes through different states of sensations…

I make an effort, so I think…

1) I'm on an "air cushion" today !

2) What I feel good today !

3) I feel good today !

4) I do not feel very well today !

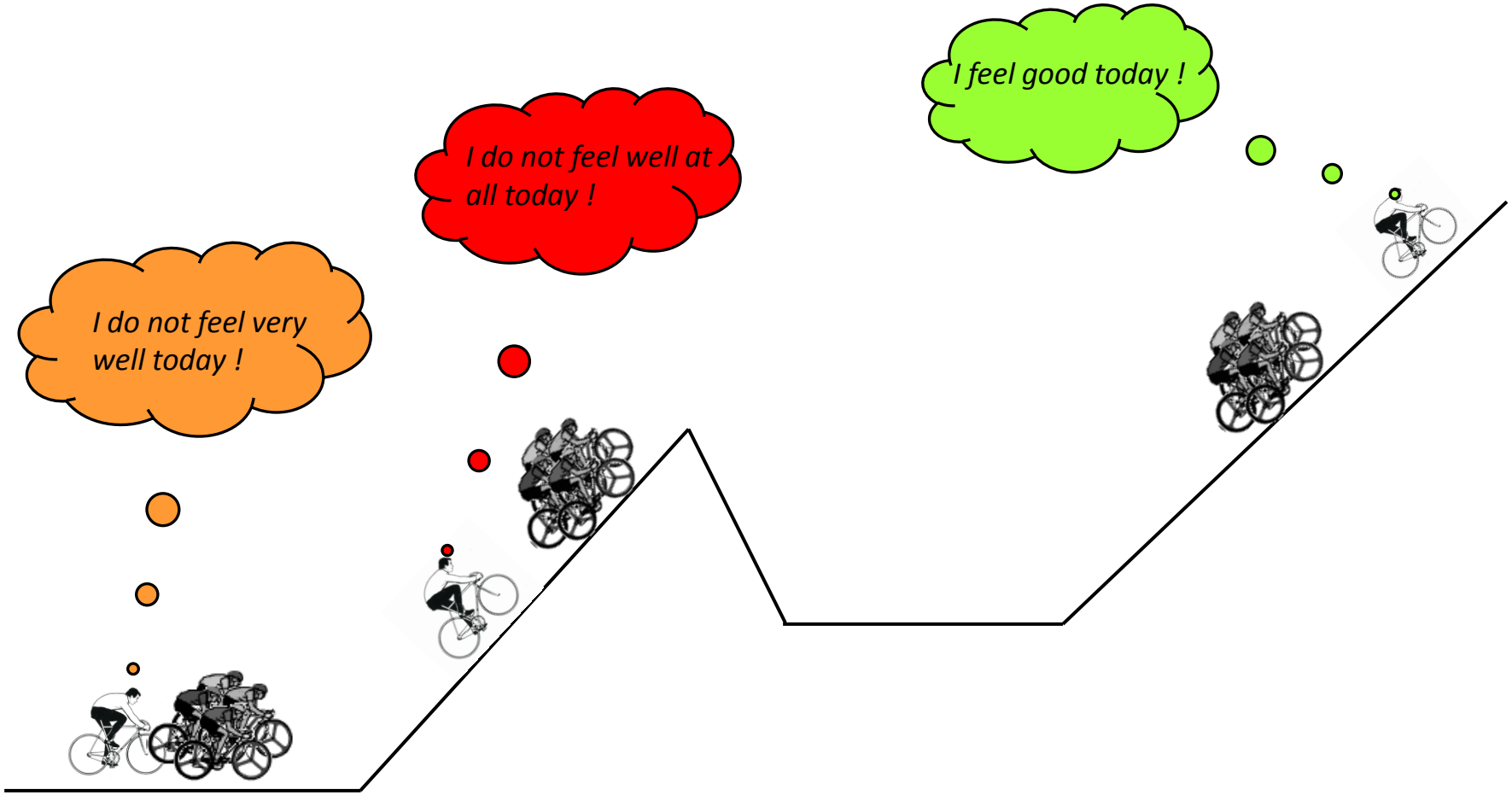
5) I do not feel well at all today !

6) It's to hard today !

Between different days…

During a day…

Different feelings in the same day with different positive-negative responses



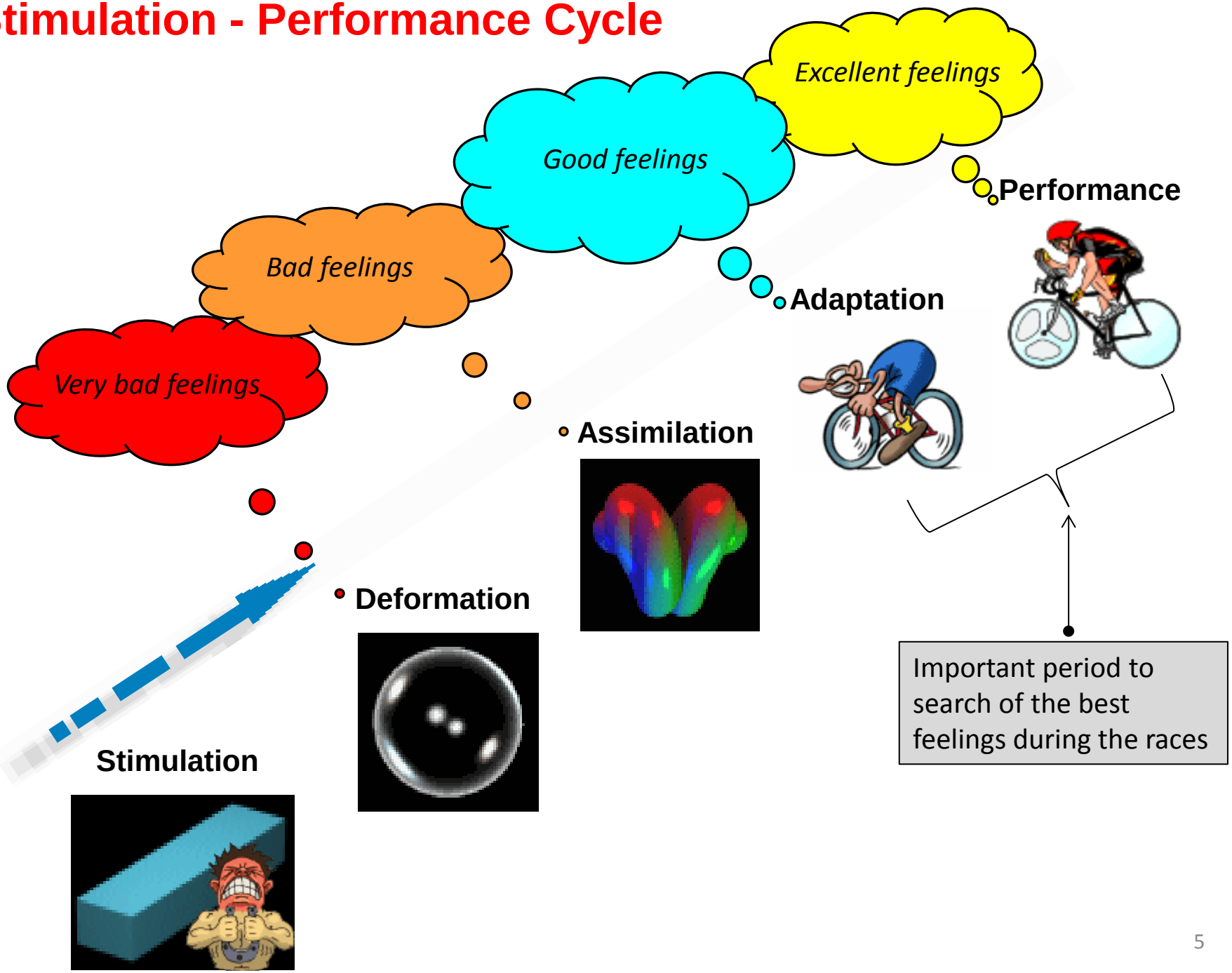
A search of the best feelings during the races…

I don't yet have the speed in my legs

I felt fatigue in the legs and it loose in the head…

I want to find good feelings

Stimulation - Performance Cycle



Is there a phenomenon "good day - bad day" ?

Is it possible to analyse to the day to day variability (DDV) ?

What are the mechanisms underpinning DDV in athletes?

What are the effects of the DDV on the level of performance?

Is there a concept of cyclists responders and non-responders ?

Why the leaders rarely have bad days?

Why in stage races the leaders have great regularity of form every day?

How the cyclist sets the power he develops?

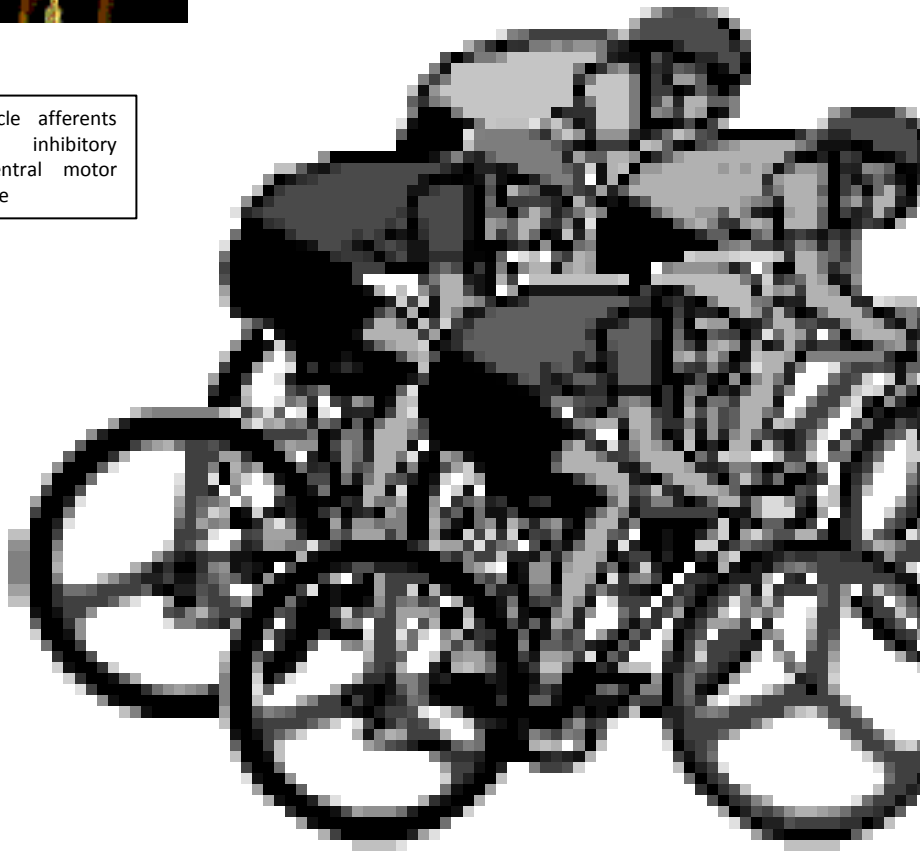
Volontary stimulation

corollary discharge model

Neural process

RPE

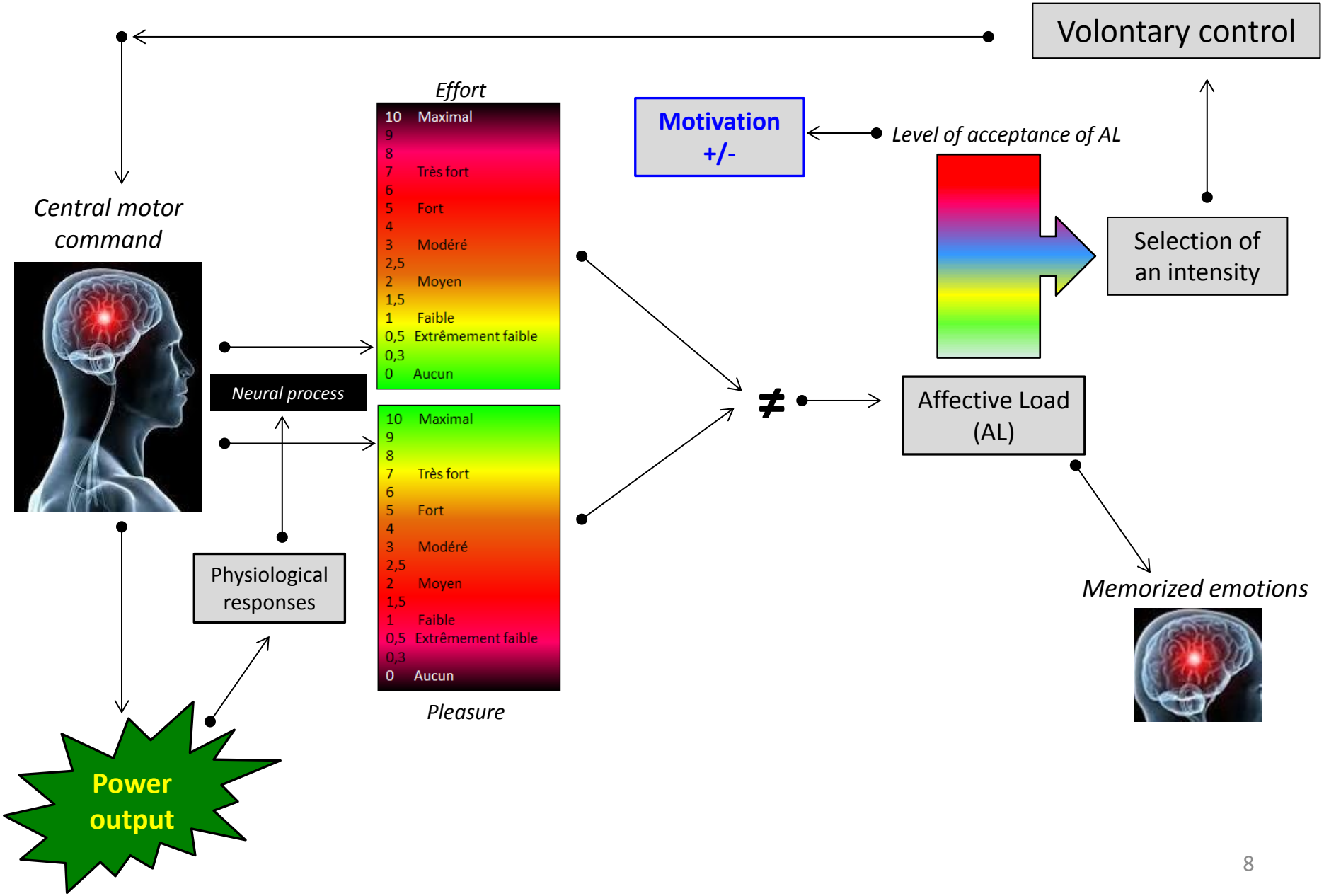
Group III/IV muscle afferents could play an inhibitory influences on central motor drive during exercise



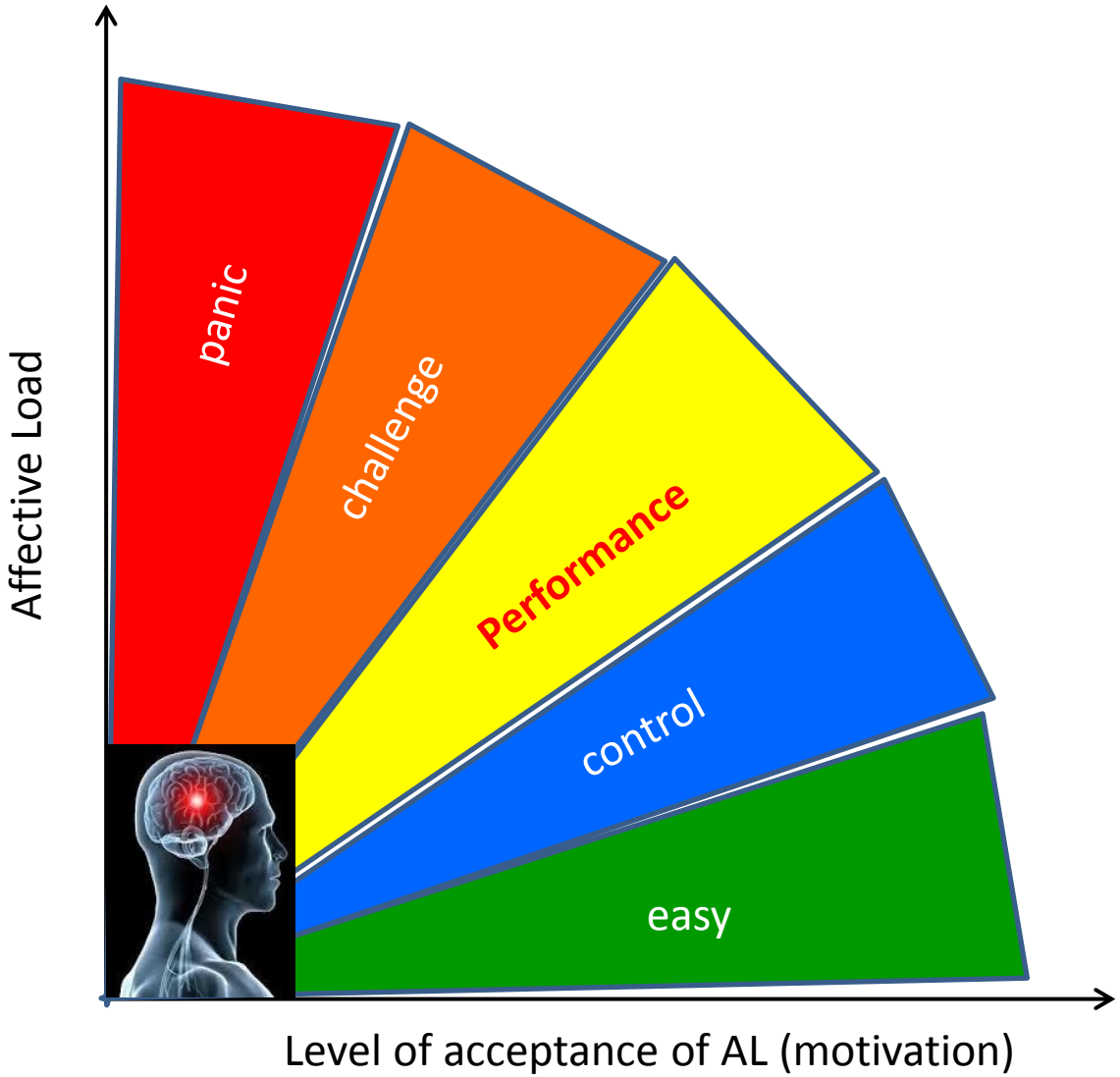
Power output

Affective Load model

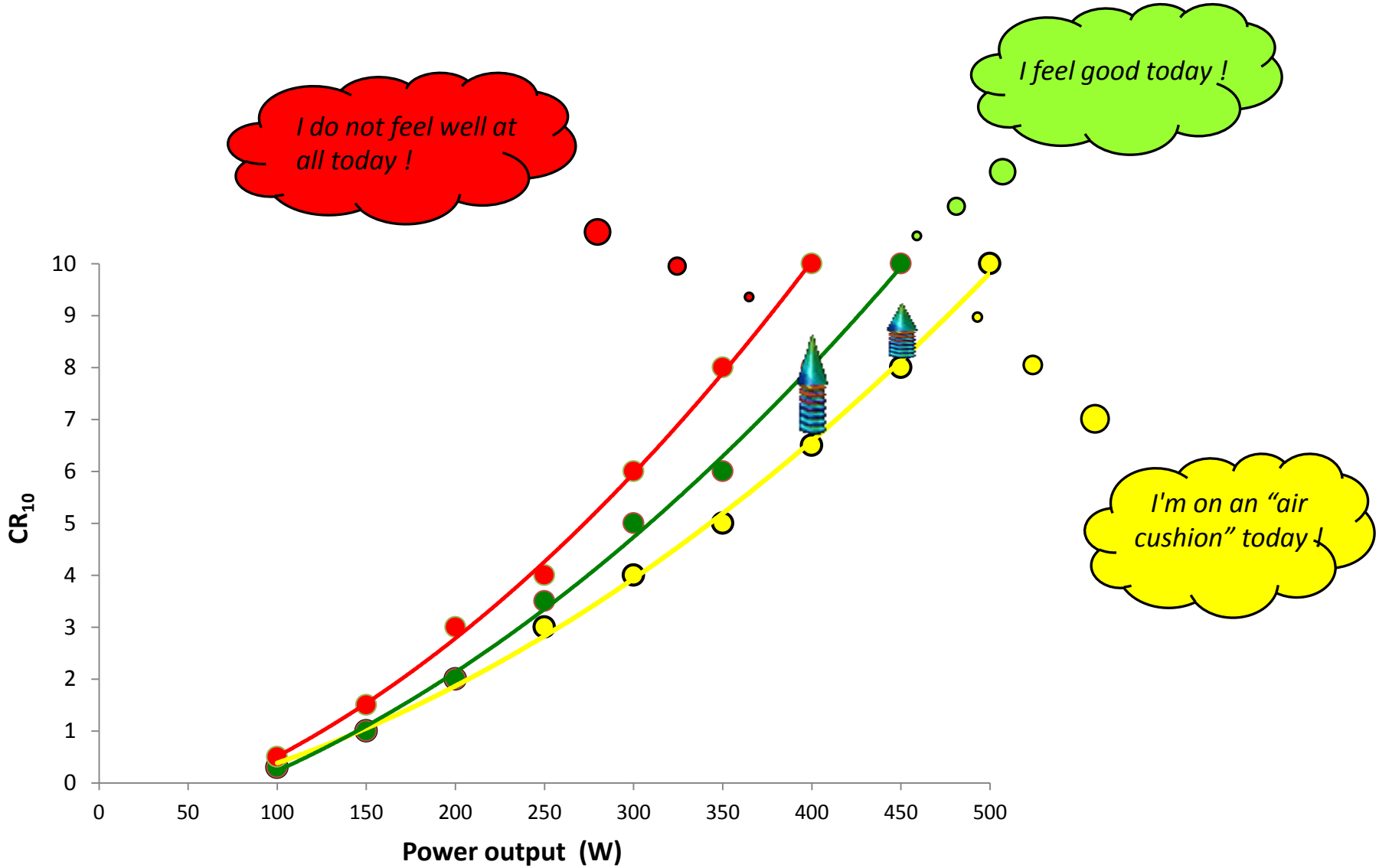
(Baron et coll., 2009)



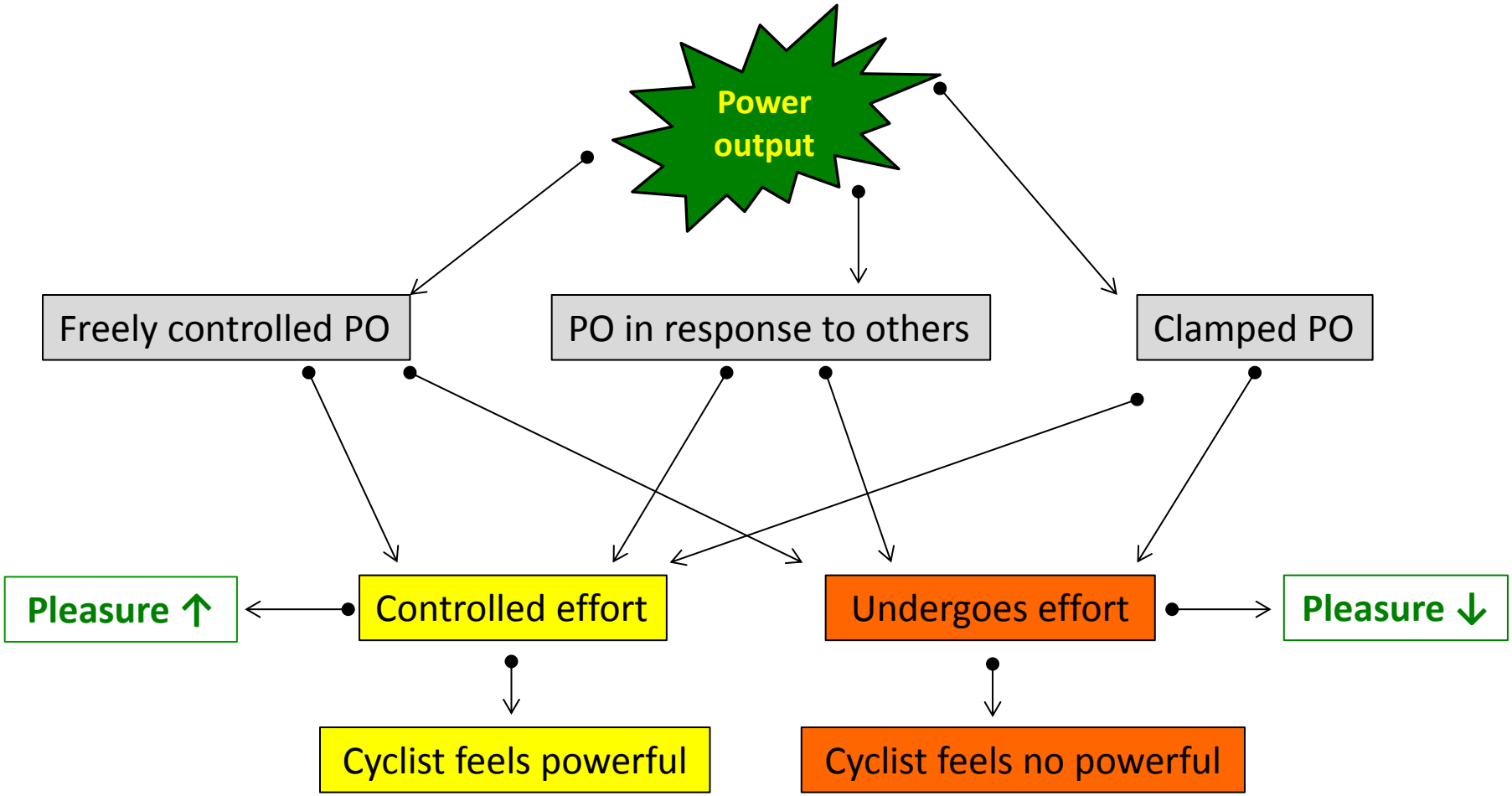
Balance between the Affective Load and the level of AL acceptance



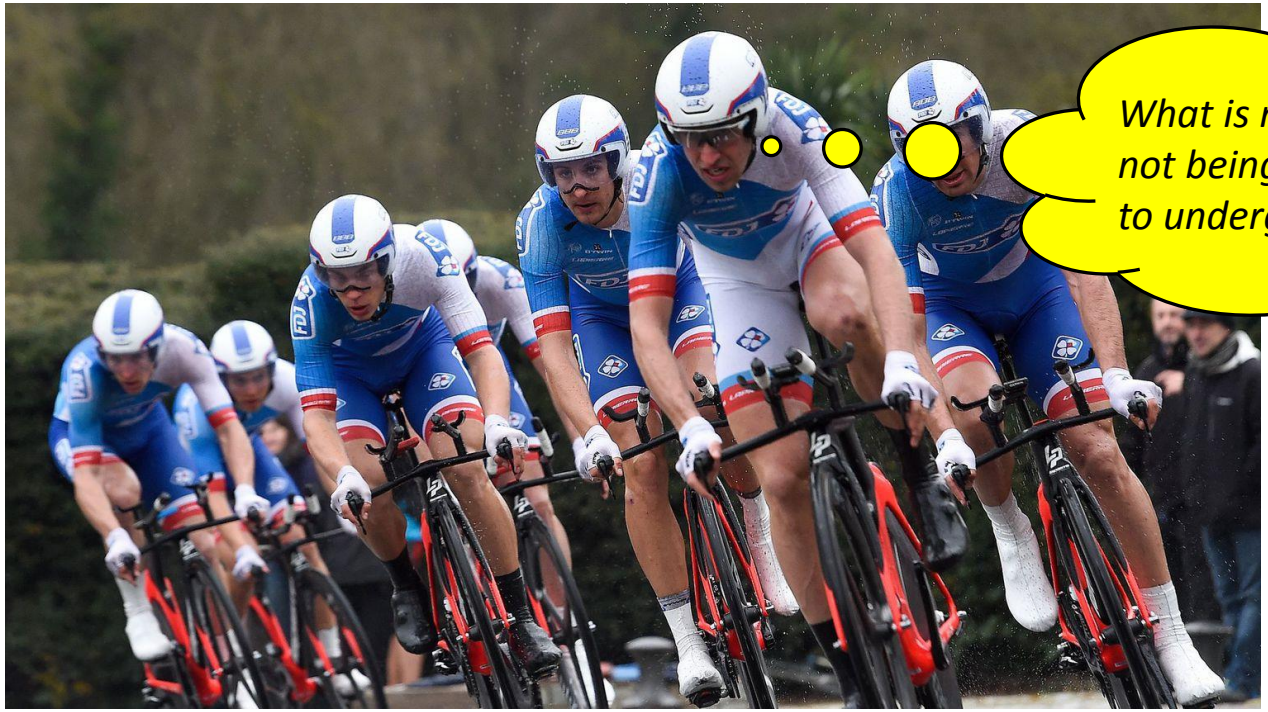
RPE - Exercise intensity relationship



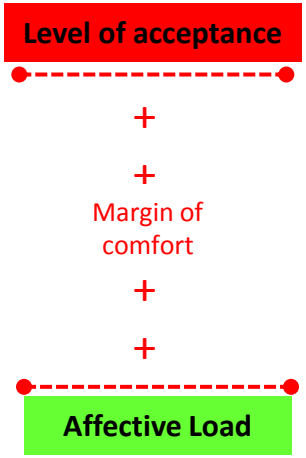
Different perceptive processes to develop power output…

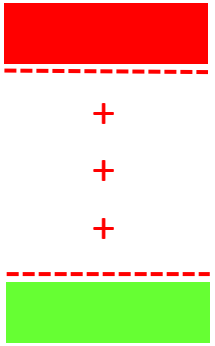


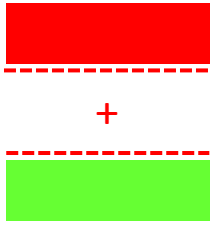
How the brain manages these different processes to produce PO?

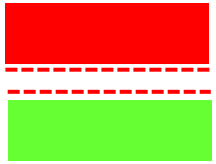


What is my margin of comfort before to not being able to control my effort and to undergo it?



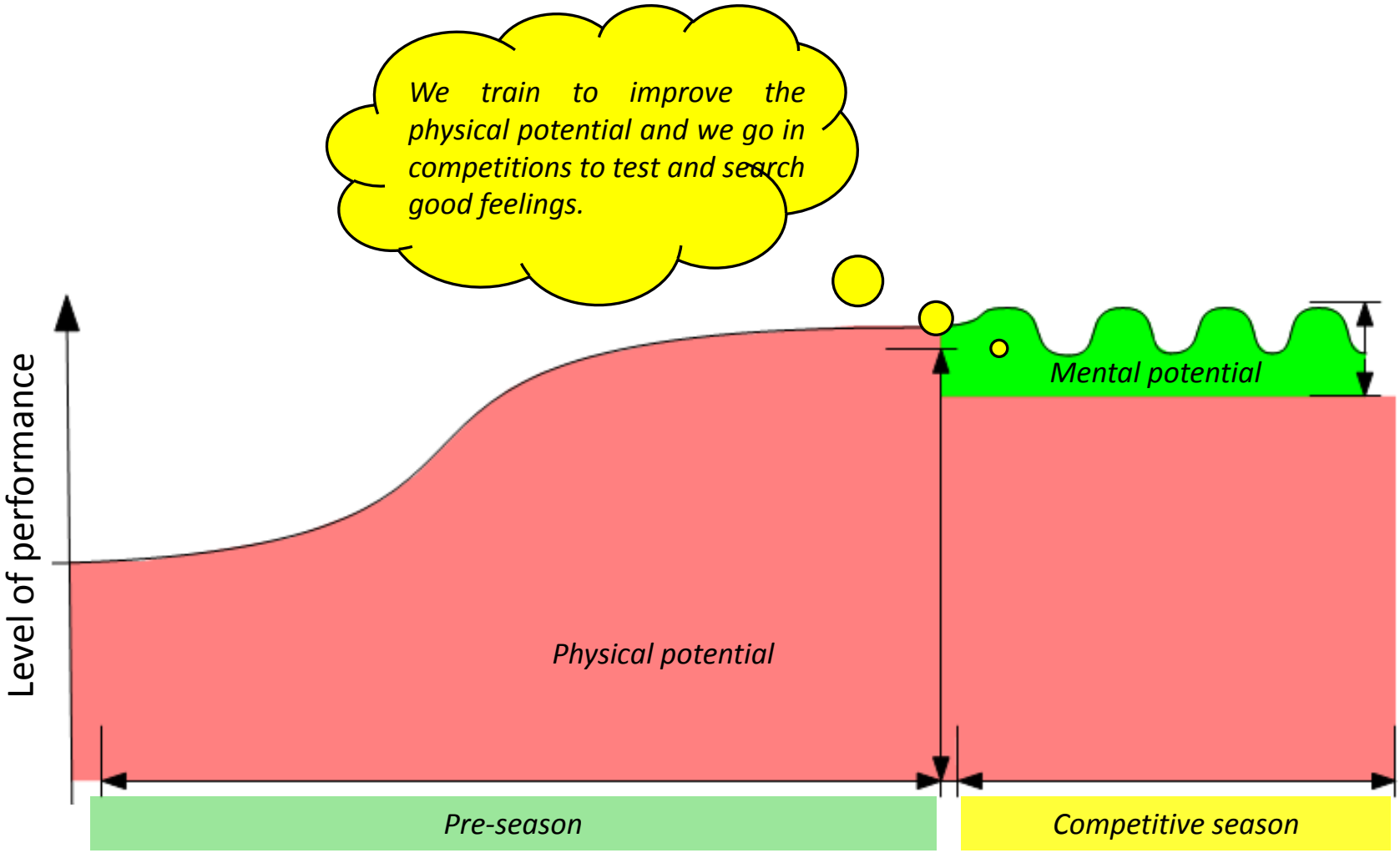







I put myself in the red, I have to drop my pacing
I have no margin, I no longer try to follow
I have again small margin, I can accelerate…

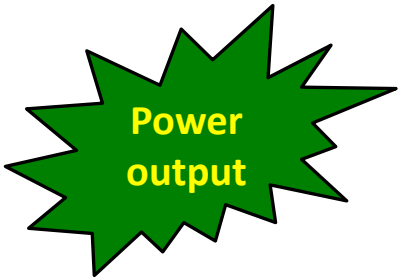
Stimulation balance between physical and mental potential



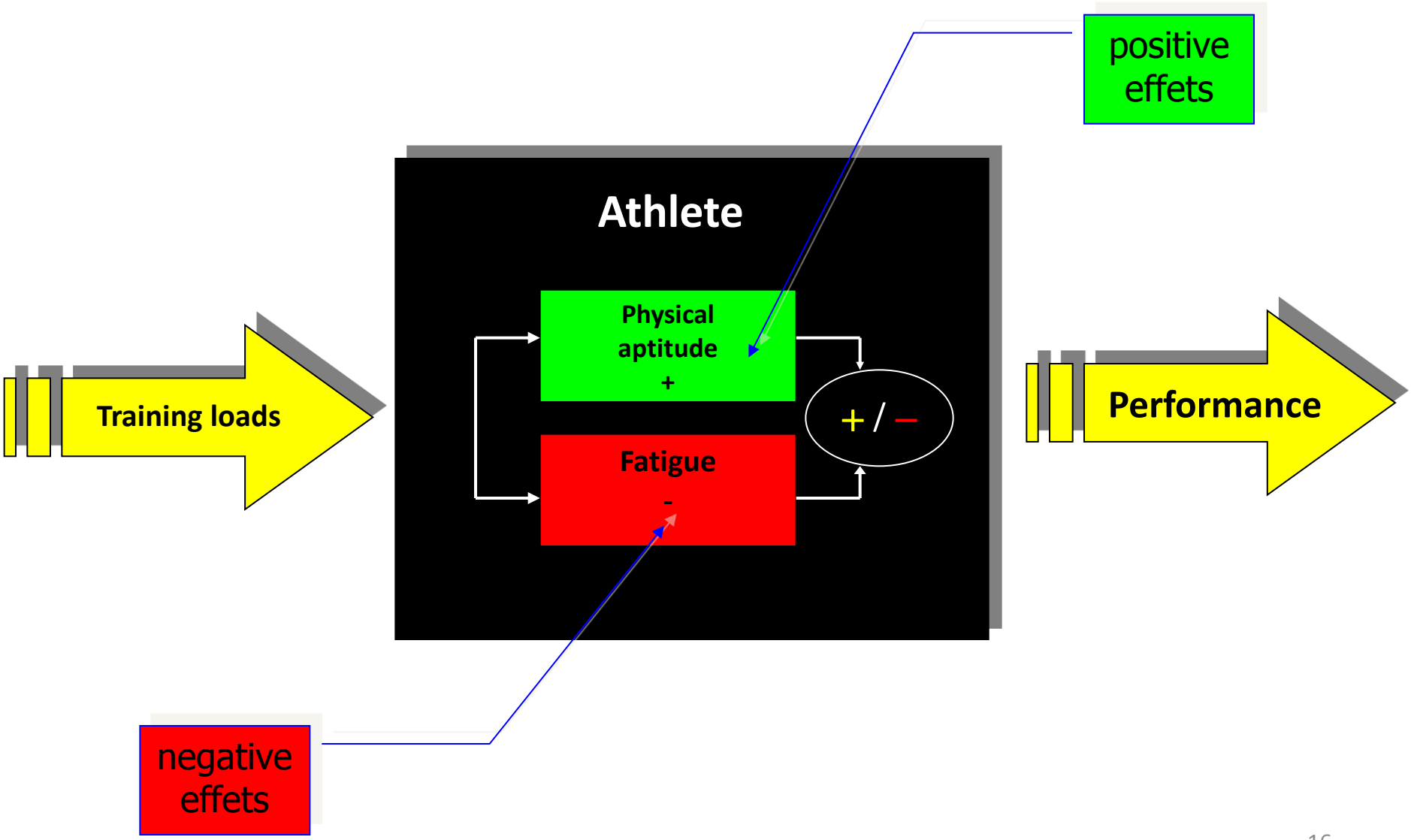
Factors affecting the "good day - bad day" phenomenon

- a lot of factors act,
- difficult to identify one determining factor,
- there are many interactions,

Perceptive process →



1 - Training loads management



Perceptual response during exercise

Is a complex process

Five cumulative training loads (TL) play an important role

Analyze of the training intensity distribution (TID)

TL 1
Day before

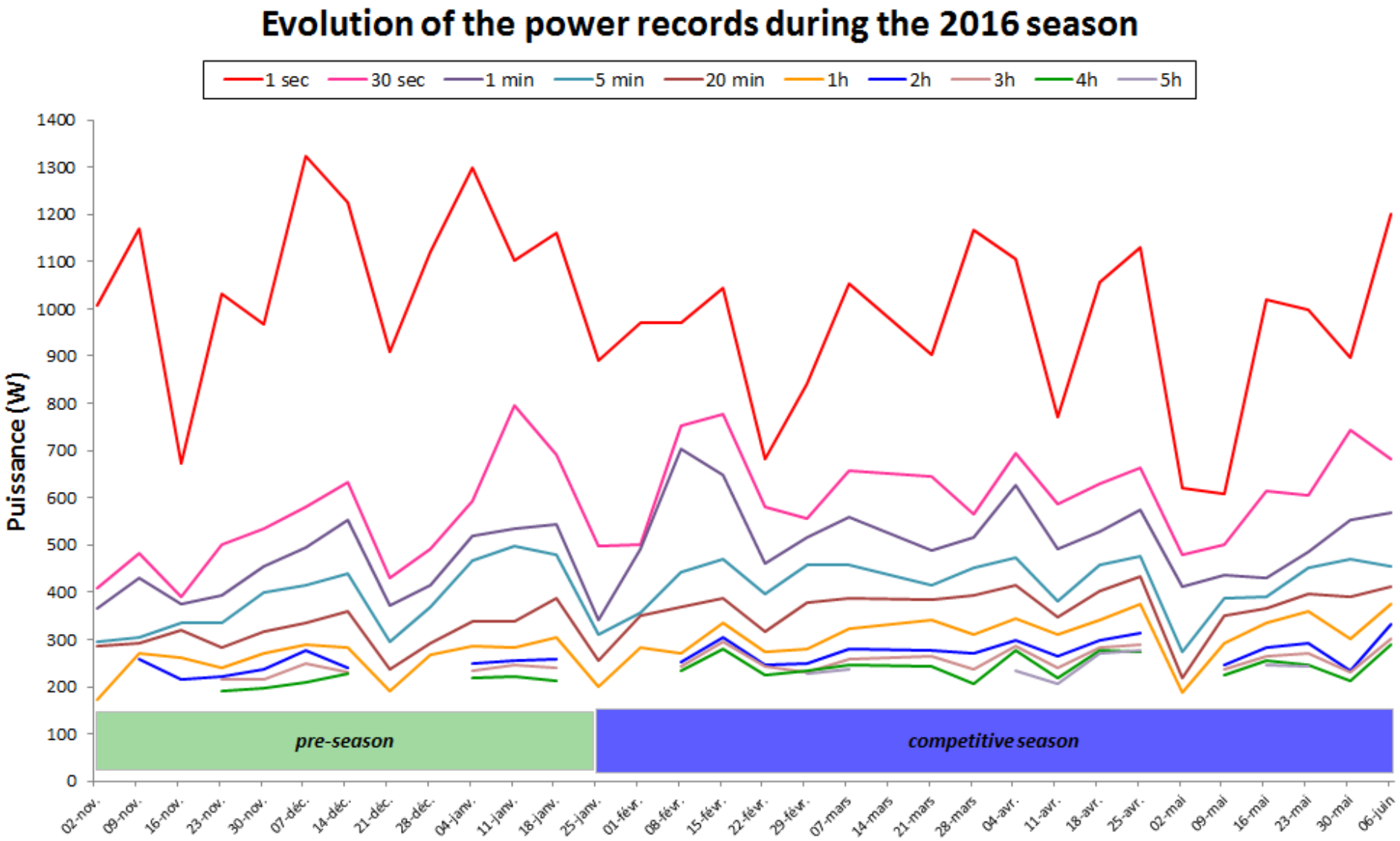
TL 2
micro-cycle

TL 3
Current year

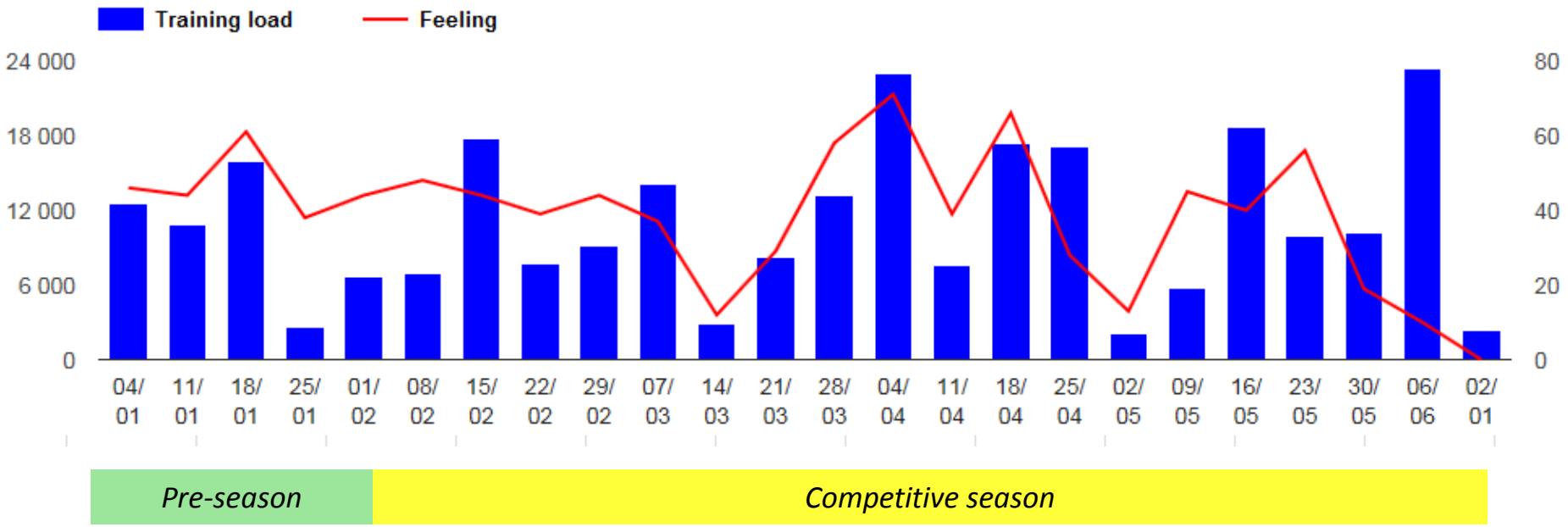
TL 4
Last year

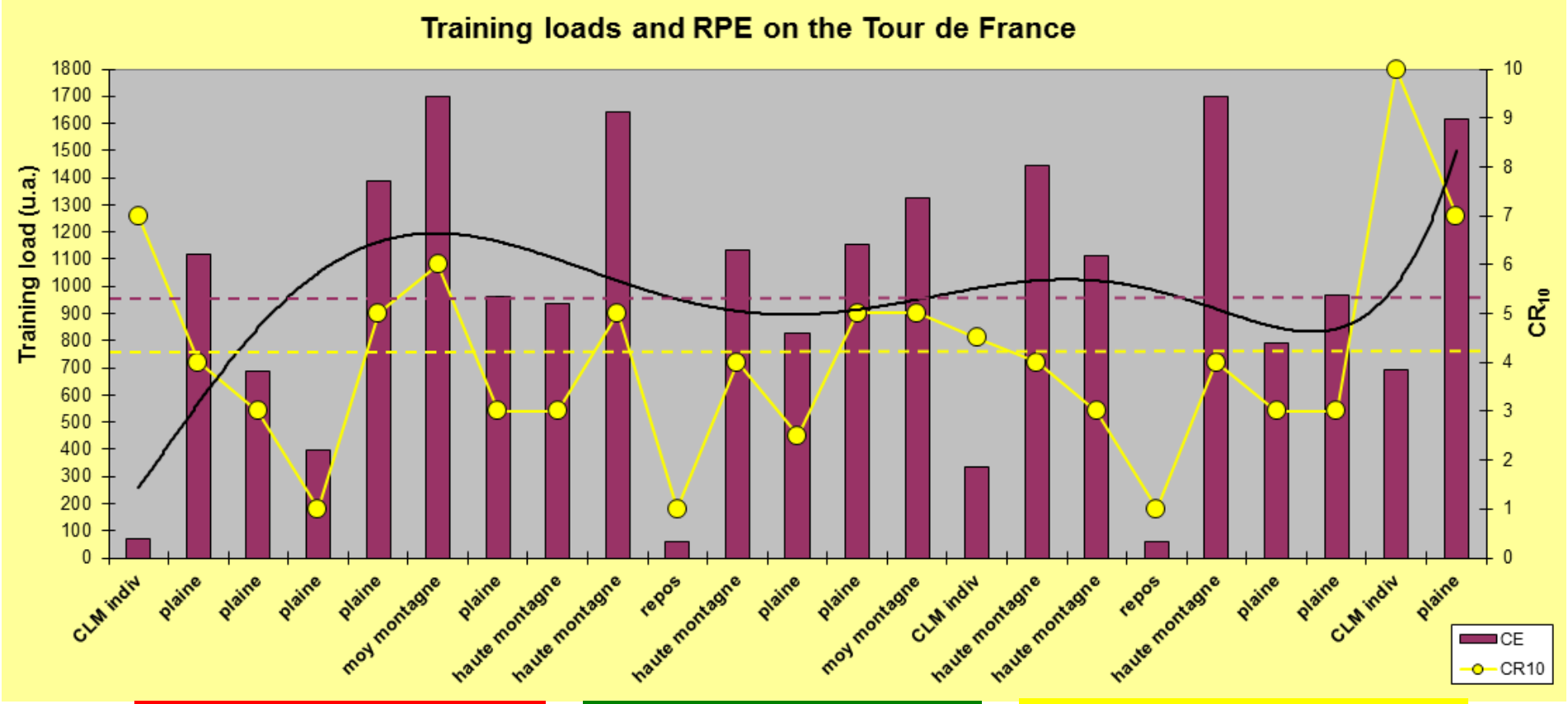
TL 5
Several years

Variability in the record power profile between the weeks



Different positive - negative responses during the season



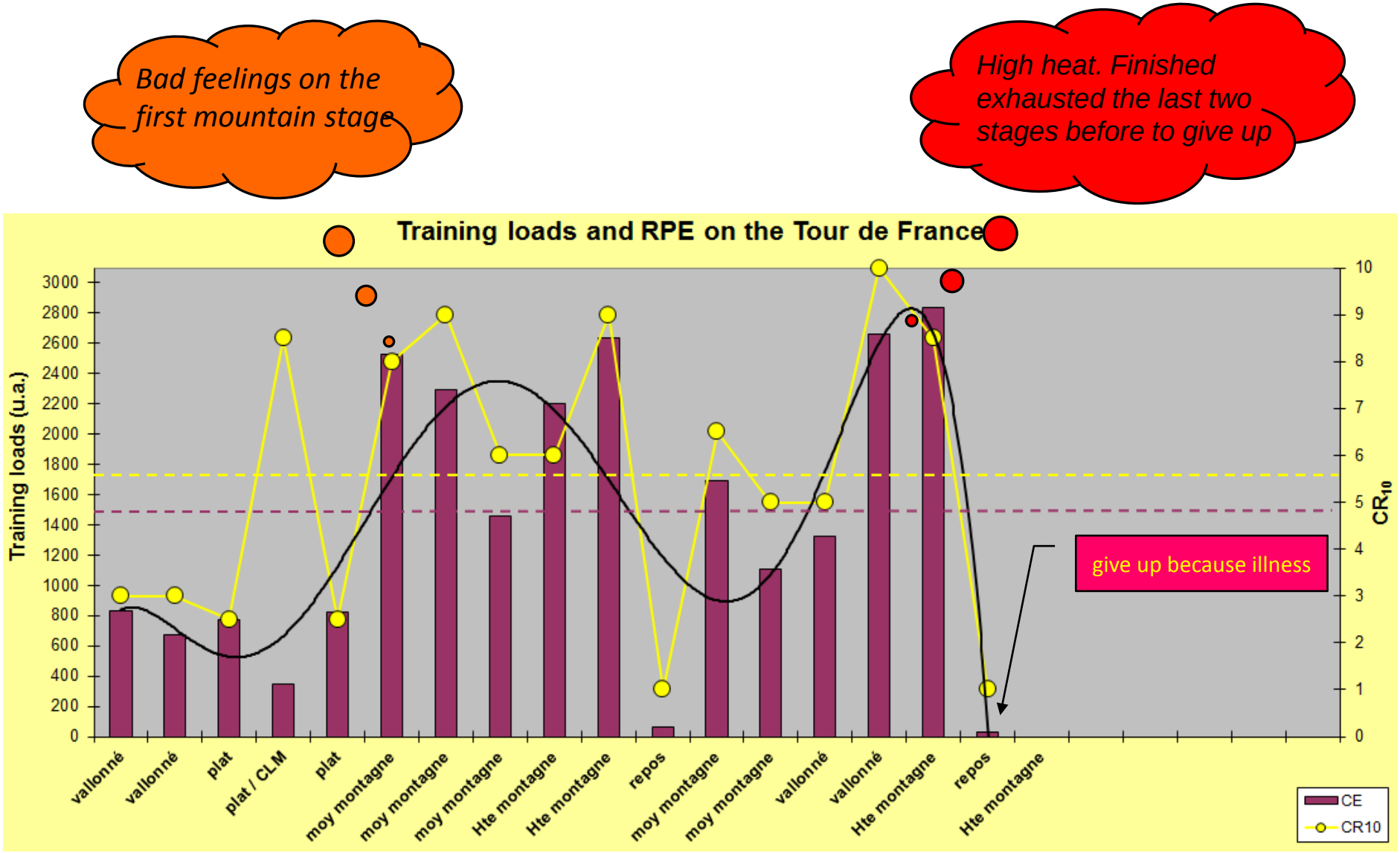


Week 1 : bad feeling

Week 2 : good feeling

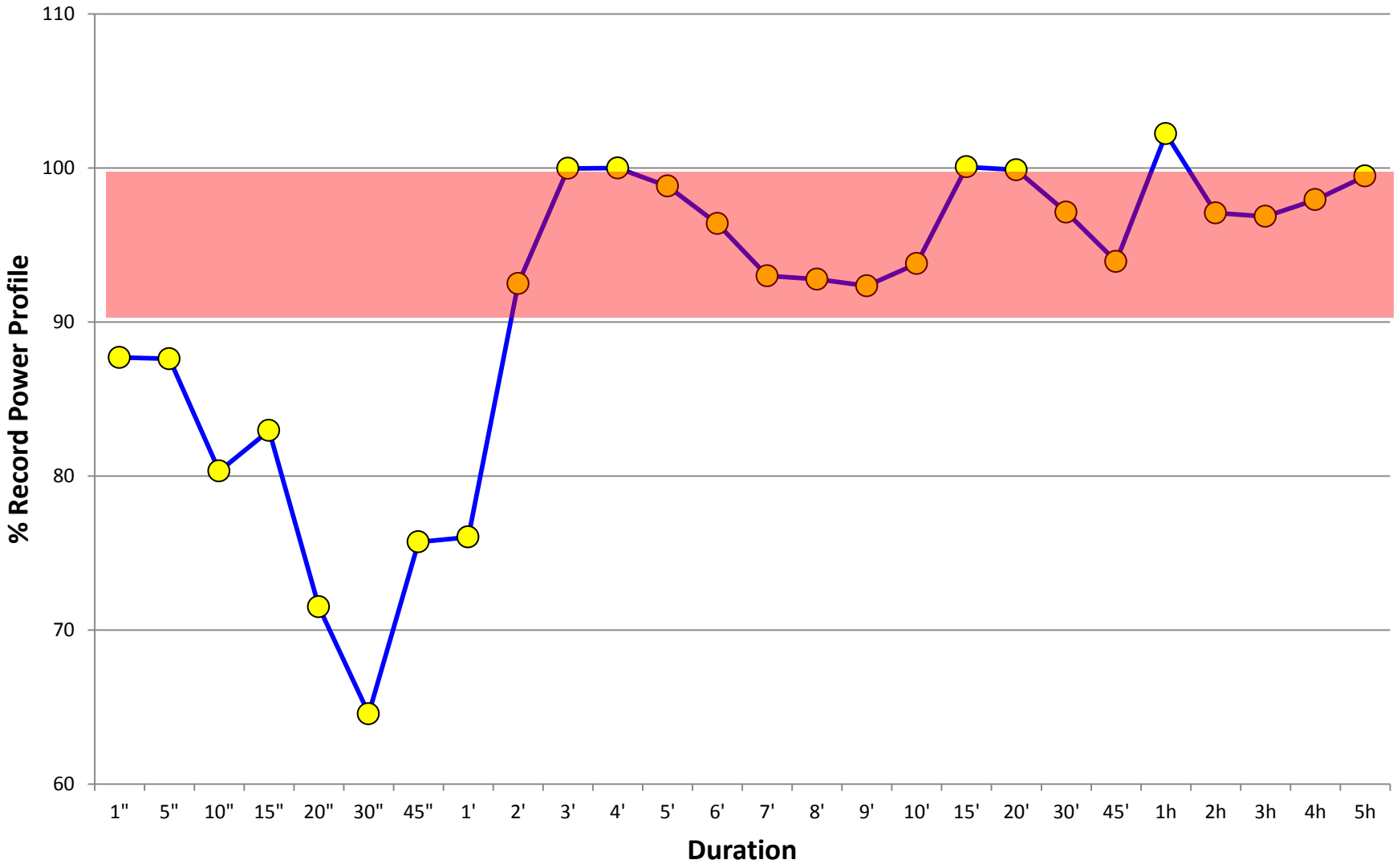
Week 3 : Excellent feeling

The race is over with a level of fatigue not maximal with a relative freschness



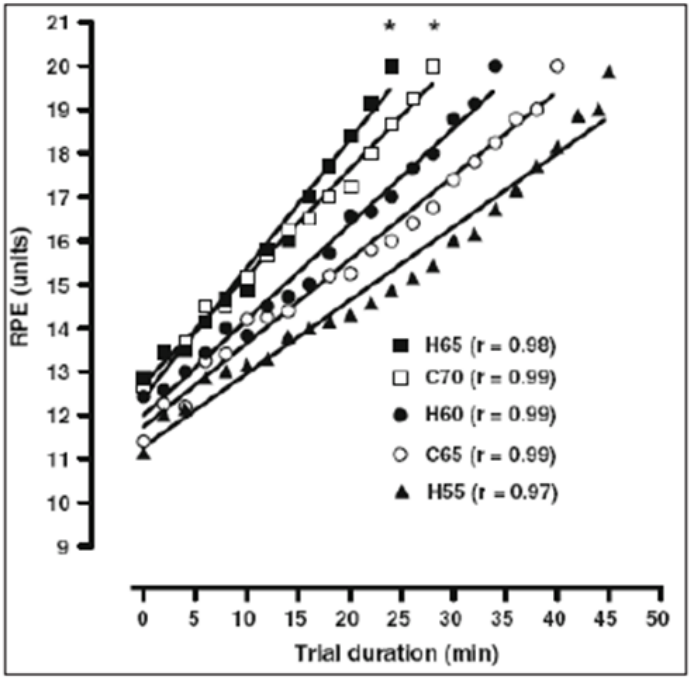
Tour is over due to illness but having had some good feelings in general

Stimulation profile during the Giro 2016 to a teammate sprinter



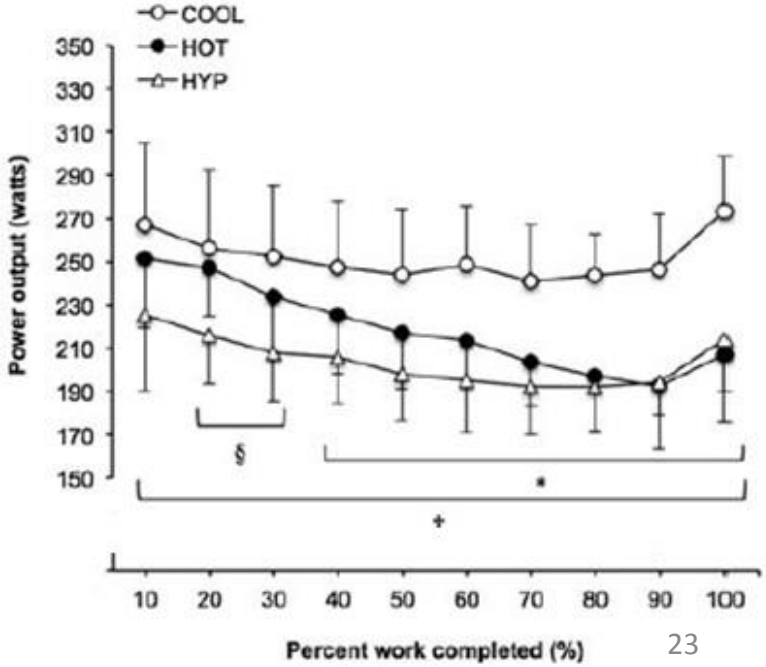
2 - Environmental conditions

Important effects of heat on RPE at different intensities



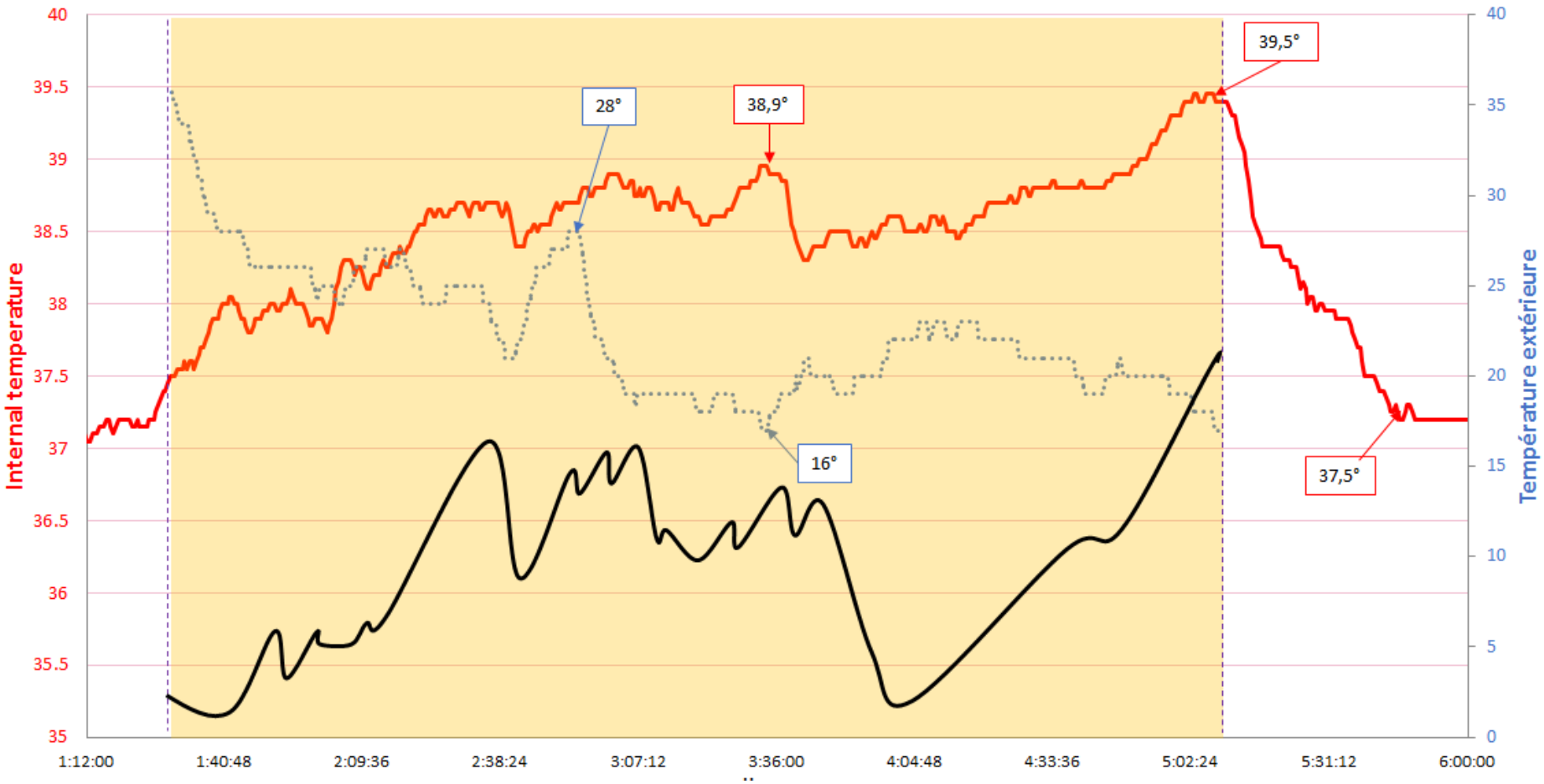
Hot (H) and Cold (C) environments at 55, 65, 70% of PMA (Crewe et coll, 2008)

Important effects of heat and hypoxy on power output



Power output during a selfpaced time trial in COOL, HOT, and HYP conditions (Périard et Racinais, MSSE 2016)

Evolution of internal temperature in a cyclist during a race

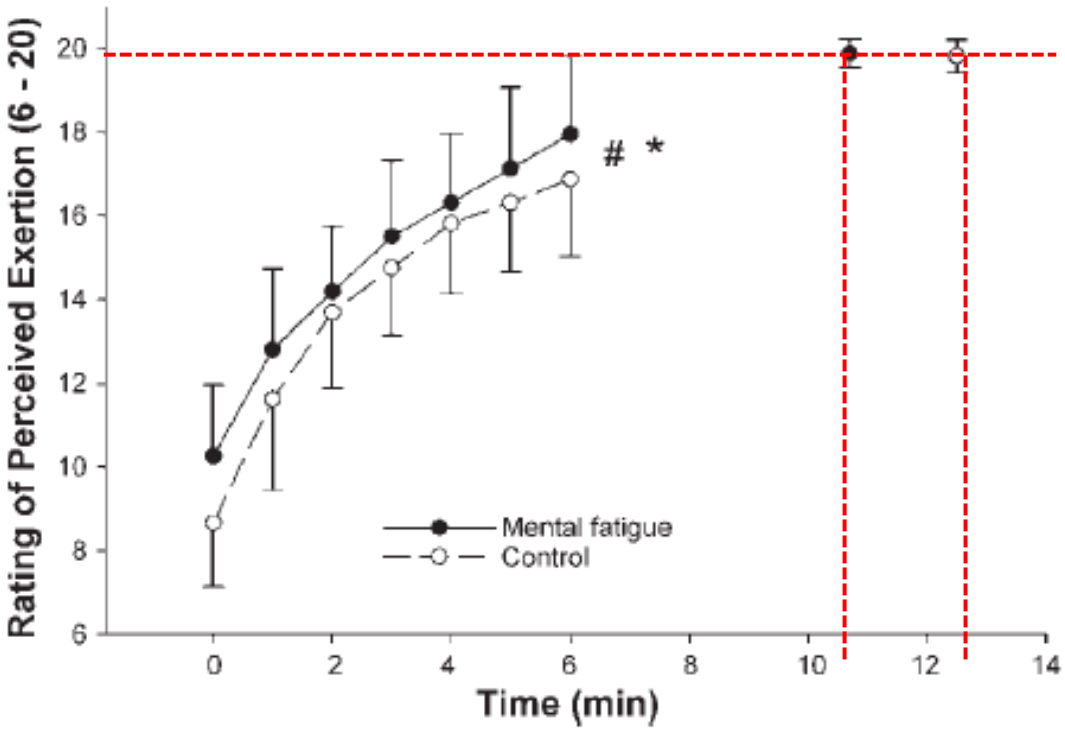


e-Celsius®

3 - Peripheral and central fatigue

4 - Mental fatigue

Mental fatigue is a psychobiological state caused by prolonged periods of demanding cognitive activity and characterized by subjective feelings of “tiredness” and “lack of energy”.
Mental fatigue impairs physical performance…



*Effect of mental fatigue on perception of effort during high-intensity cycling exercise to exhaustion at 80% of peak power output (*Marcora 2009)

5 - Attentional strategies used

Bertollo et coll. (2015)

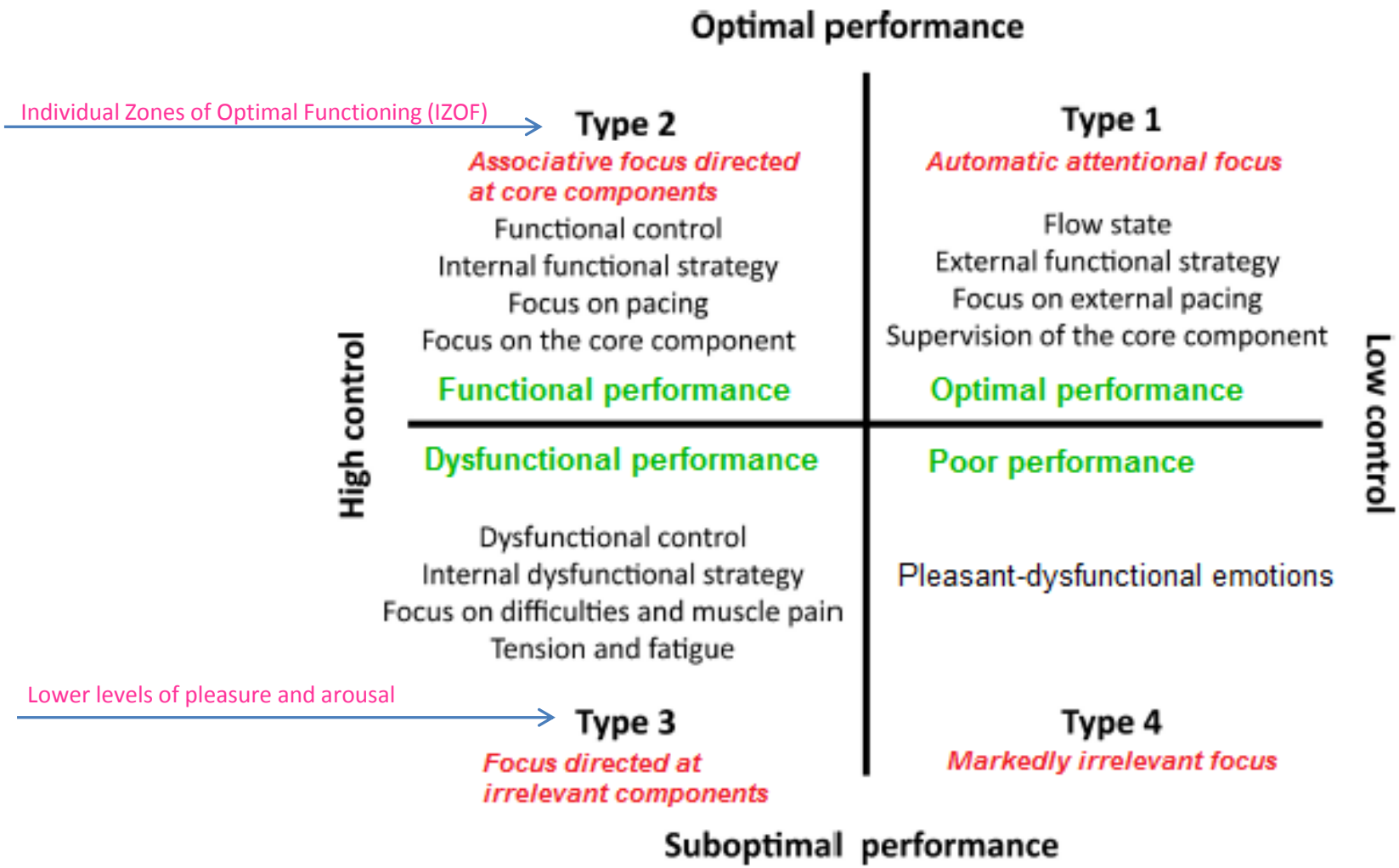
To perform optimally, athletes must be able to employ different attentional strategies to control external and internal distracters, while focusing on body and task-relevant cues (Tenenbaum, 2001, 2005).

Association occurs when athletes monitor their body sensations (e.g., respiration rate, body temperature, muscle pain and tightness).

Dissociation occurs when individuals ignore pain, fatigue, or boredom by directing their attention outwards or by focusing on pleasant stimuli.

The Multi-Action Plan Model (Bertollo & di Fronso, 2015)

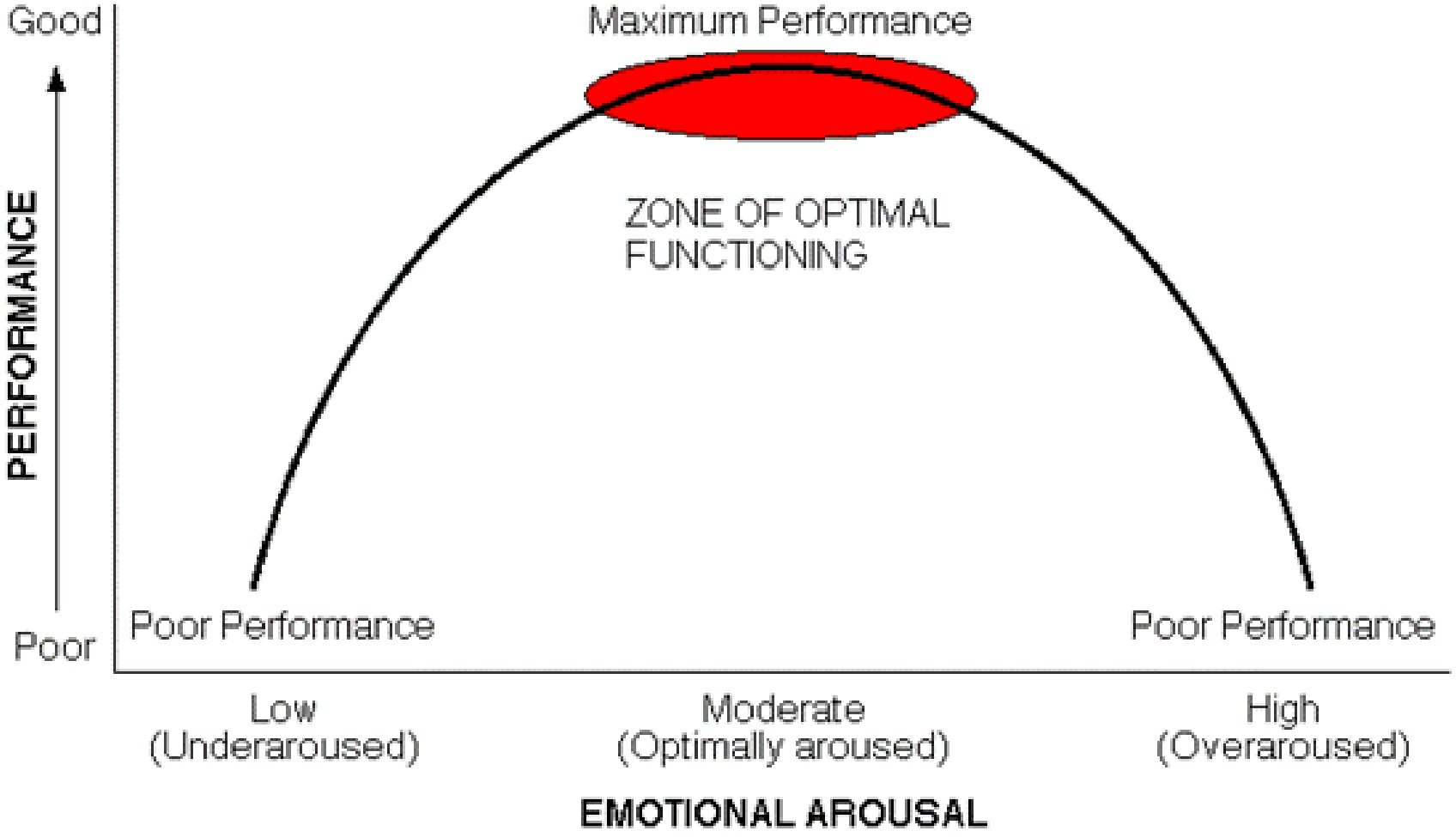
Different attentional strategies lead to different performance states.



The MAP model is idiosyncratic in nature, thus assuming that one's strategies and behaviors during performance are unique.

6 - Individual Zones of Optimal Functioning (IZOF)

Hanin and Yuri (1997, 2000)



7 - Thinking - Action and the cognitive control

Brick et coll, (2016)

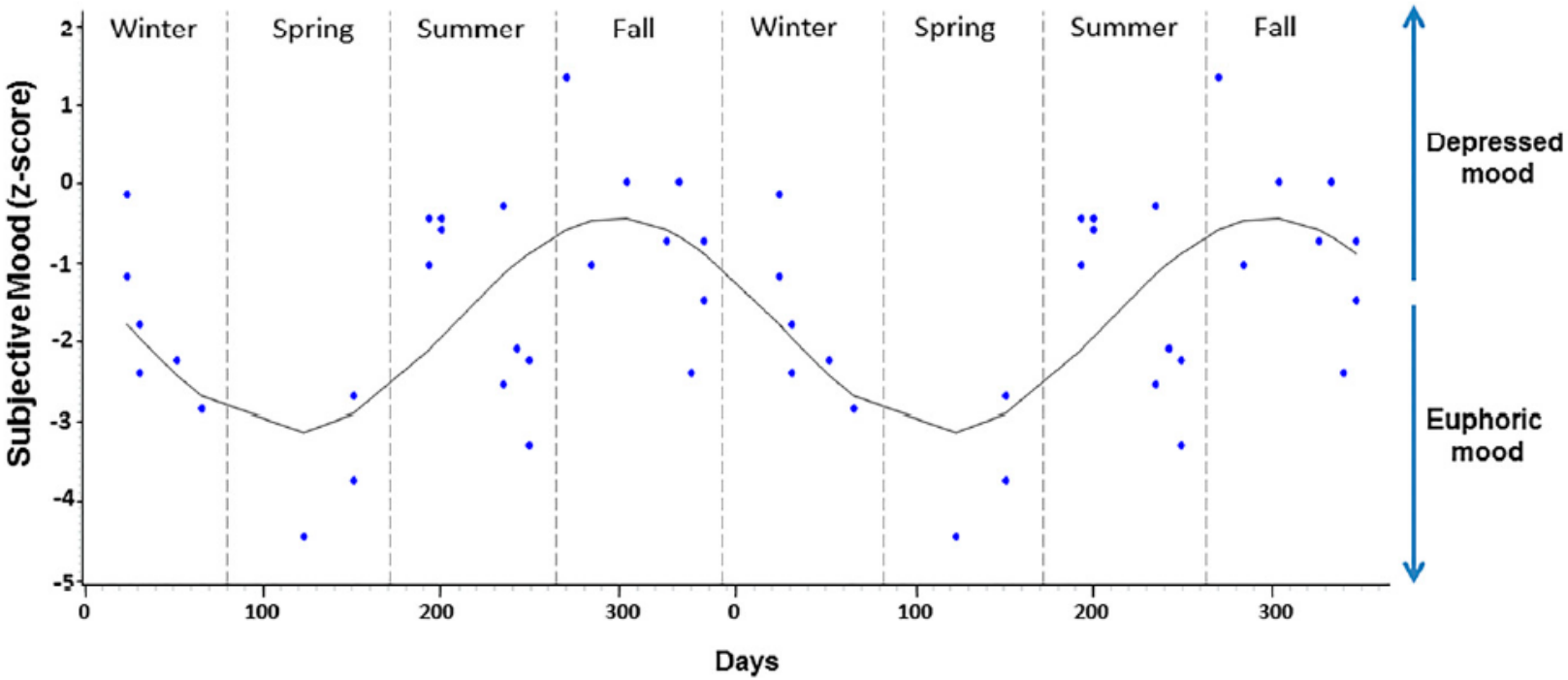
Cognitive control operates via two distinct modes: proactive control and reactive control

One can speculate that prolonged endurance activity in itself may induce mental fatigue and reduce regulatory control.

8 - Seasonal variation in human executive brain responses

Meyer et coll. (2016)

Mood has been the most extensively studied aspect of human behavior, with a large portion of the general population undergoing seasonal deteriorations in mood in winter.



The blue dots represent individual raw data and the black line represents the sinusoidal fit. Fitted maximum of subjective mood was observed on October 31.

9 - Photic memory for executive brain responses

Chellappa et coll, (2014)

In humans, light also regulates sleep and wakefulness and constitutes a powerful stimulant for alertness and cognition.

The integration of light exposure over long periods of time can help optimize cognitive brain function.

10 - Motivational self-talk

Blanchfield et coll, 2014

Motivational self-talk should be effective at not only enhancing motivation but at regulating effort.

Motivational self-talk reduced RPE and increased time to exhaustion during high-intensity cycling exercise.

Others important factors…

11 - Geometry of the field

12 - Pacing of the race

13 - Perception of the shape of the others

14 - Level of motivation

15 - Mental toughness

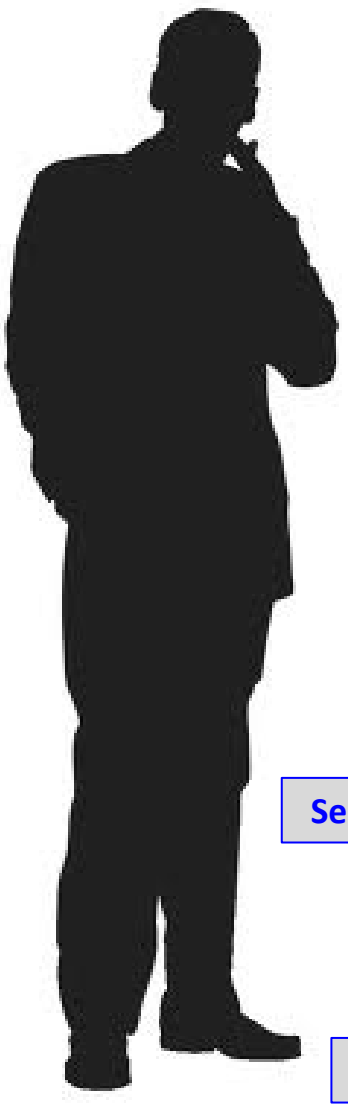
16 - hydration status

17 - sleep/wake rhythm

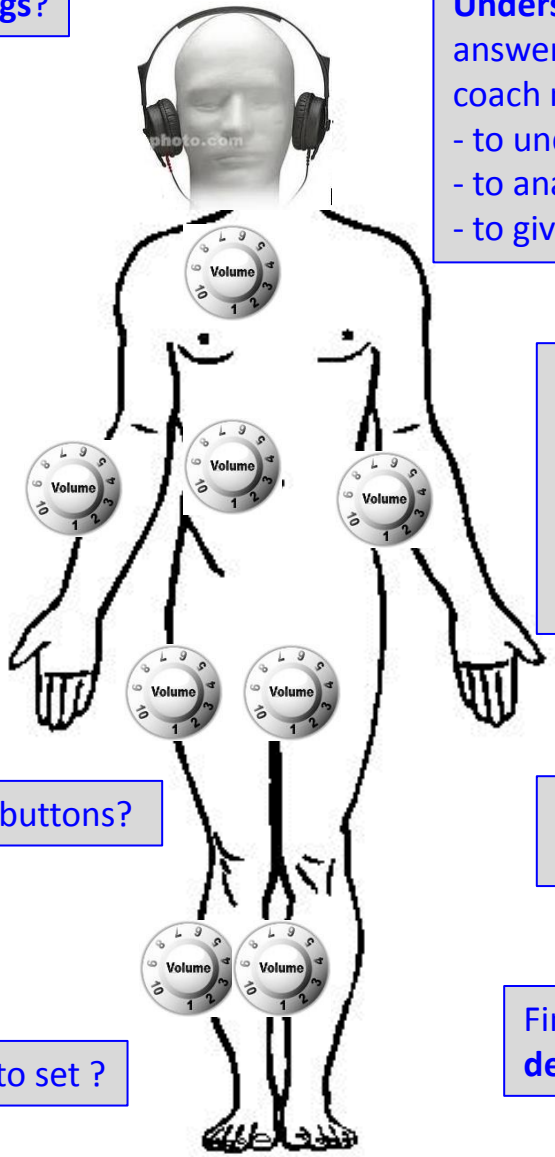
18 - food intake

19 - social interactions

What role of the coach near the athlete?



What settings?



Understand the athlete and learning to tame his answers. As every athlete has their own answers, the coach needs :
- to understand
- to analyze
- to give the best answer

Athletes have the ability to rate effort independently from other sensations related to the exercise. Consequently, special attention is to be paid by coaches to ensure that subjects **do not include other exercise related sensations in their rating of effort**.

Sensitivity of the buttons?

What is the **perceptual sensibility** of the athlete?

What buttons to set ?

Find innovative applied perspectives to **decrease perception of effort** in athletes.

The global model of pacing's process