



RECOVERY basics

Dr Kevin CAILLAUD PhD

Head of Exercise physiology & Nutrition

Basics of recovery

Nutrition

Hydration

Rest

Sleep

Basics of recovery

Nutrition

Hydration

Rest

Sleep

PERIODISATION

PERIODISATION

TRAIN → REST → EAT → SLEEP → REPEAT

IT'S ALL ABOUT HAVING A PLAN

PERIODISATION

TRAIN → REST → EAT → SLEEP → REPEAT

THE TRAINING PROGRAM IS DESIGNED ACCORDING TO THE MAIN PERFORMANCE GOAL FOR THE SEASON.

TRAINING LOADS ARE INCREASED PROGRESSIVELY AND CYCLICALLY.

THE TRAINING PHASES FOLLOW A LOGICAL SEQUENCE.

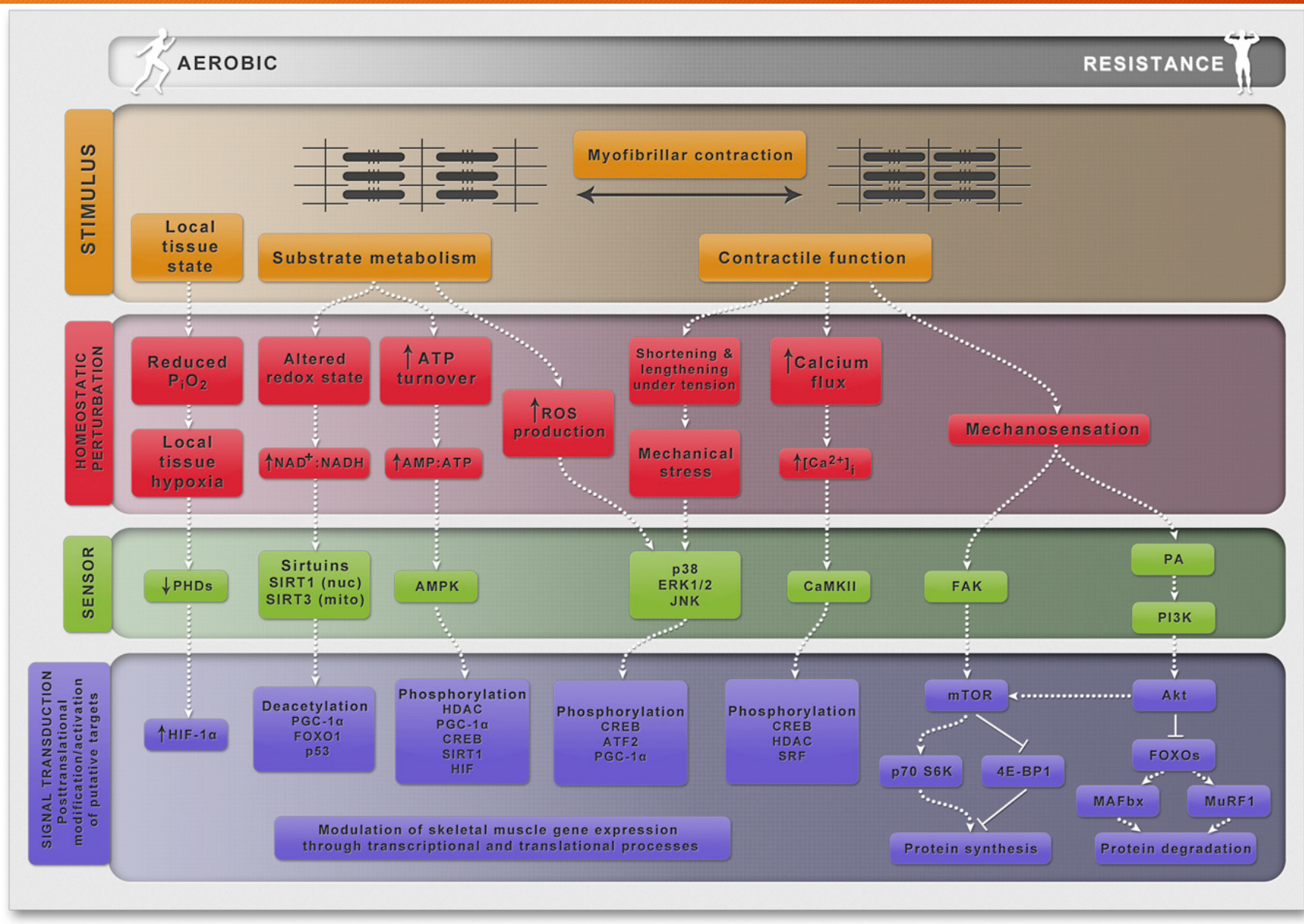
THE TRAINING PROCESS IS SUPPORTED BY A STRUCTURED PROGRAM OF SCIENTIFIC MONITORING.

RECOVERY OR REGENERATIVE TECHNIQUES ARE USED INTENSIVELY THROUGHOUT THE TRAINING PROGRAM.

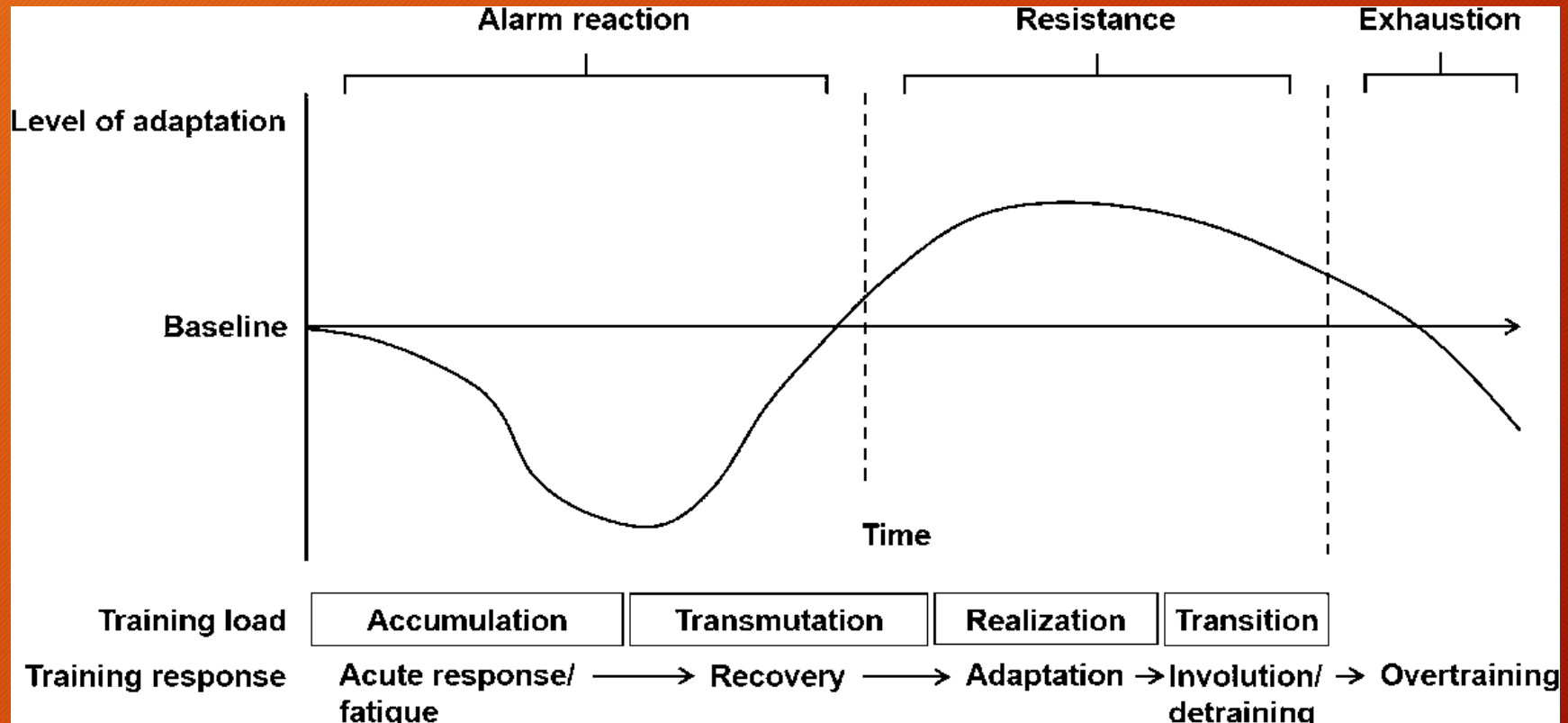
EMPHASIS ON SKILL DEVELOPMENT AND REFINEMENT IS MAINTAINED THROUGHOUT THE TRAINING PROGRAM.

THE IMPROVEMENT AND MAINTENANCE OF GENERAL ATHLETIC ABILITIES IS AN UNDERLYING COMPONENT OF THE TRAINING PROGRAM.

EACH PHASE OF THE TRAINING PROGRAM BUILDS ON THE PREVIOUS PHASE.



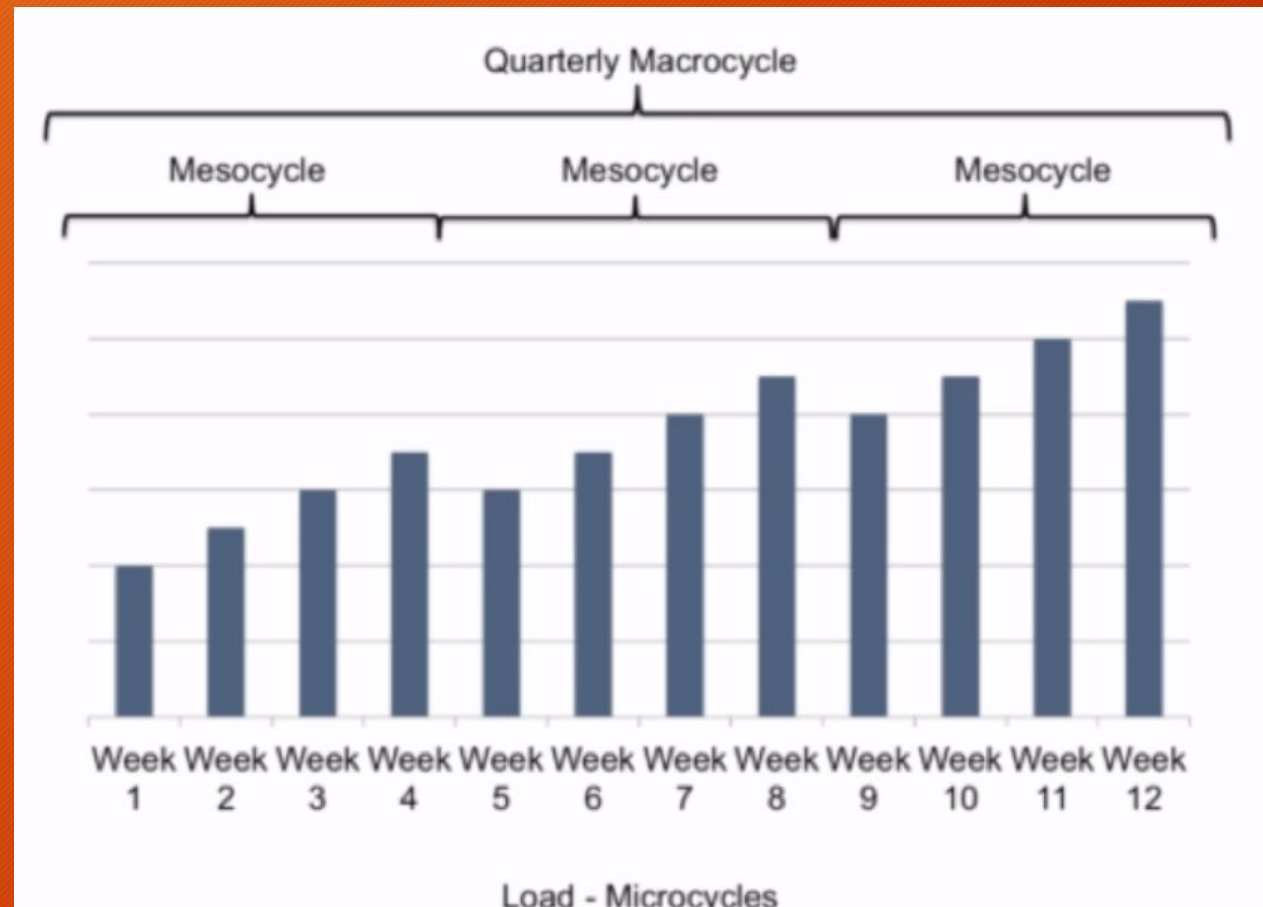
GENERAL ADAPTATION SYNDROME



Time of recovery

- 48 h and + often 48 to 72H for intense exercise involving high neuromuscular load
- Depend on:
 - level
 - volume
 - intensity
 - age

HOW CAN IMPLEMENT?



Basics of recovery

Nutrition

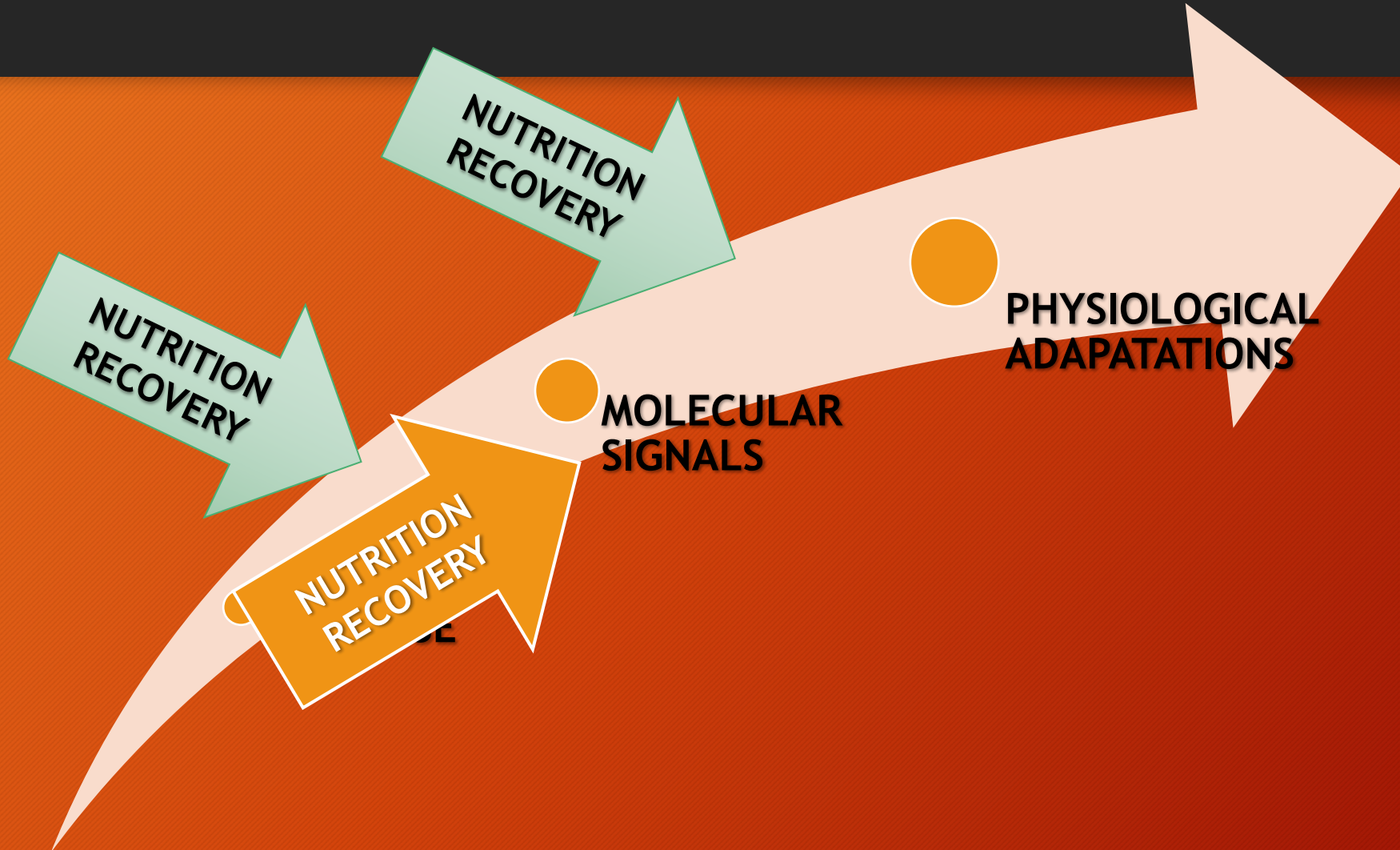
Hydration

Rest

Sleep

NUTRITION

HOW RECOVERY & NUTRITION CAN HELP ?





Nutrition

FUNDAMENTALS

	Energy	Carbohydrate	Fats	Proteins
Active	25-35kcal/kg/d	3-5g/kg/d	35 à 40% AET	10 à 20% 0,8 à 1,2g/kg
Athlete	50-80kcal/kg/d	5-8g/kg/d	0,5 à 1g/kg/d 30-50% AET	1,5 à 2,2g/kg/d
Athlete <i>Extreme situation</i>	<i>Tour de France</i> 150-200kcal/kg/d	<i>Intense Phase</i> <i>Carbs loading</i> 8-10g/kg/j	/	<i>Intense Phase</i> <i>Weight loss +++</i> 2,5 to 3g/kg/d

Fundamentals

1. Energy: carbs + fats
2. Proteins needs
3. Quality of fats

Micronutrition

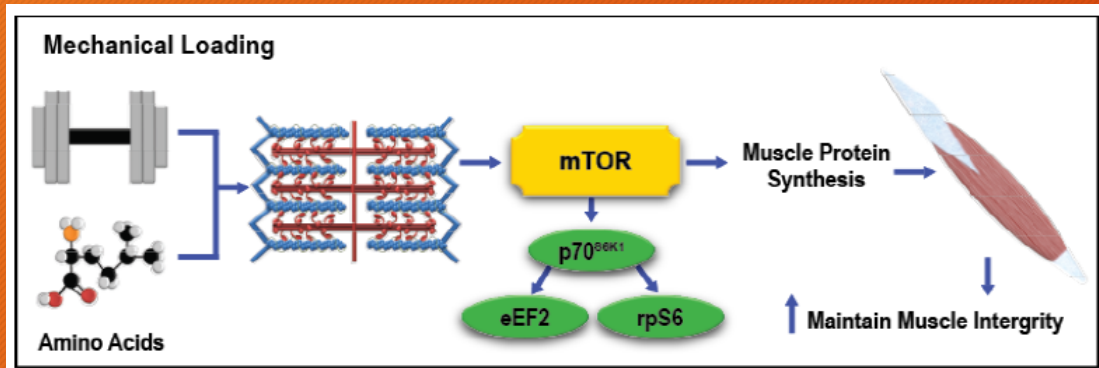
- ✓ Iron: menstrual cycle, functional hemolysis
- ✓ Vitamin D: indoor sport, dark skin, adolescence
- ✓ Calcium: sport with impacts, adolescence
- ✓ Antioxydants: endurance adaptation

ACSM Guidelines 2016

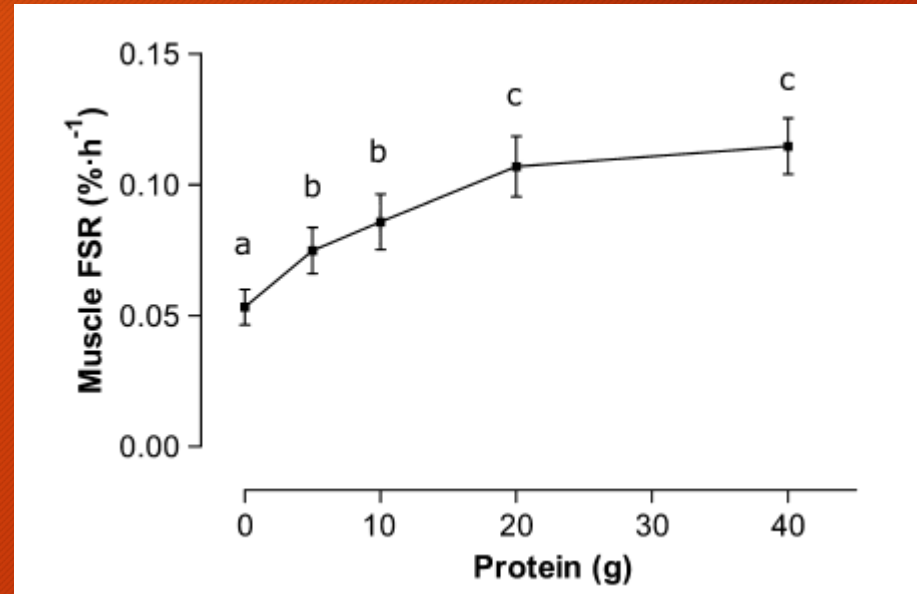
Key Point

So Nutrition isn't just PROTEINS

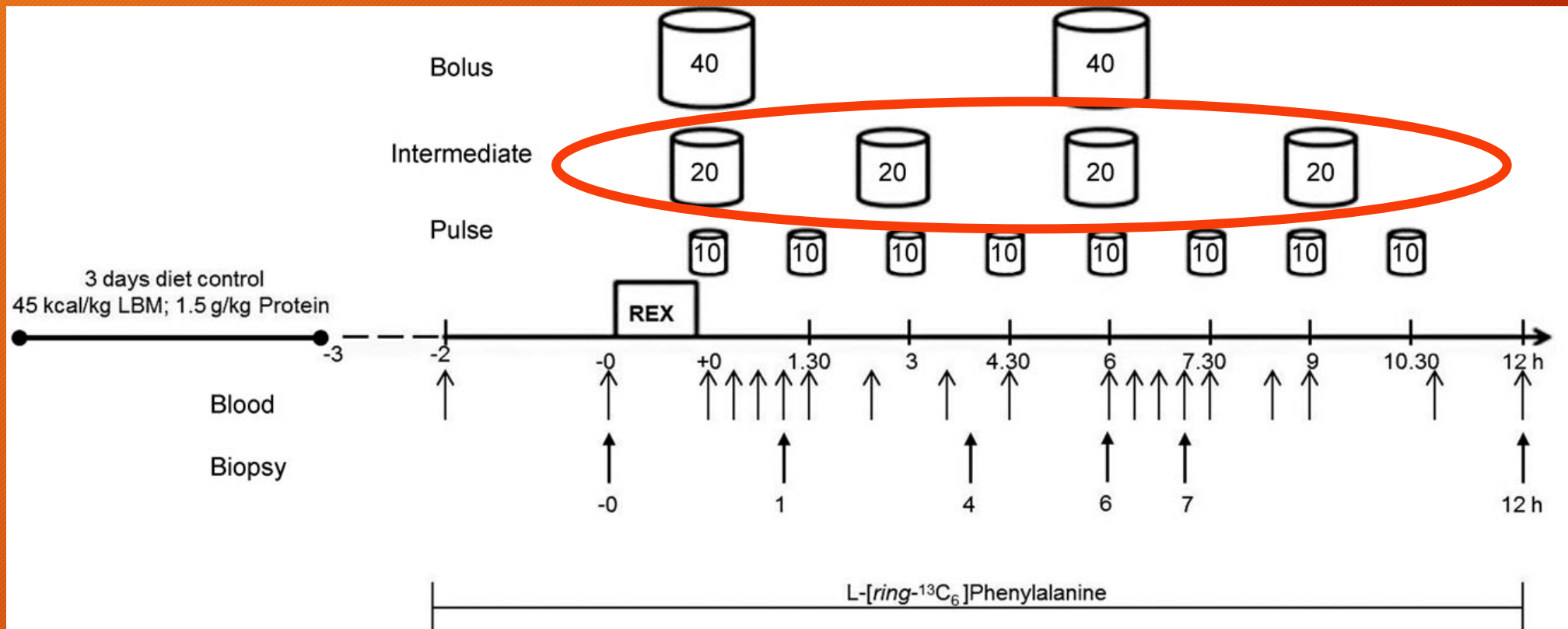
Protein optimisation

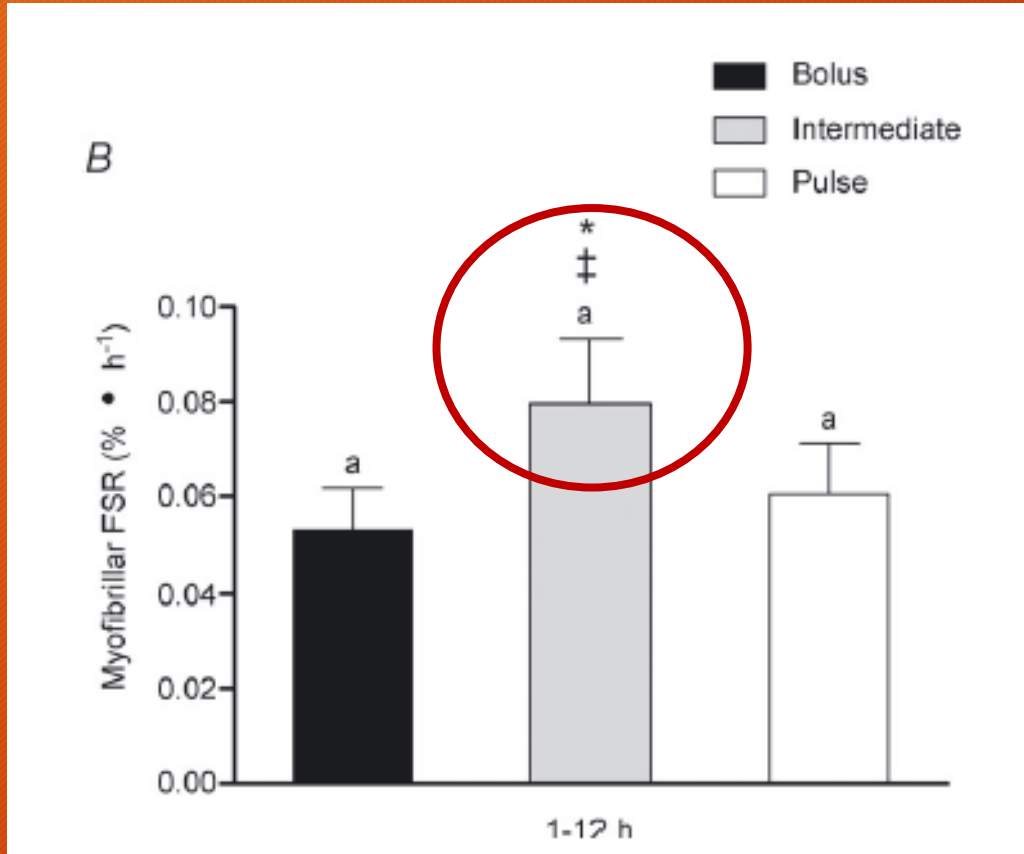


Pasiakos, 2012

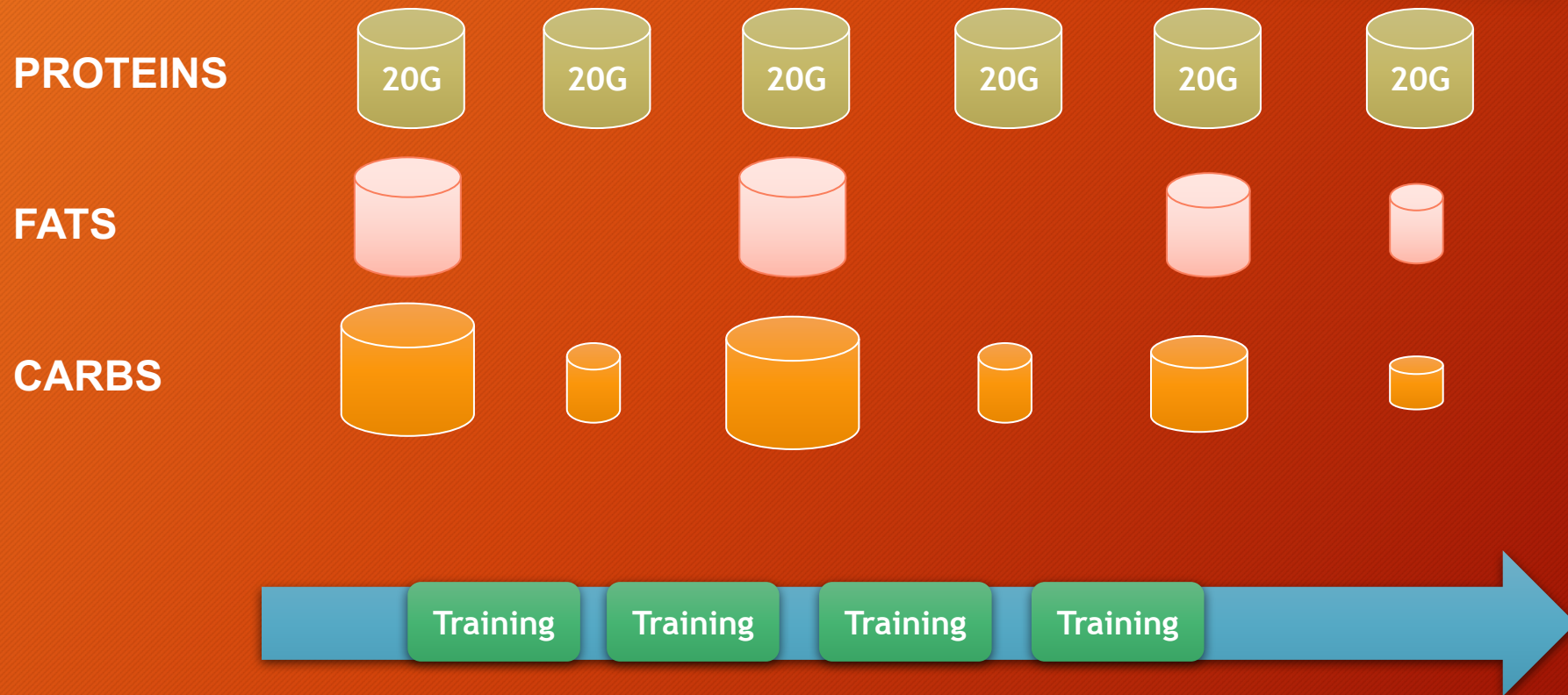


Moore et al; 2009





Protocol



POST-EXERCISE NUTRITION

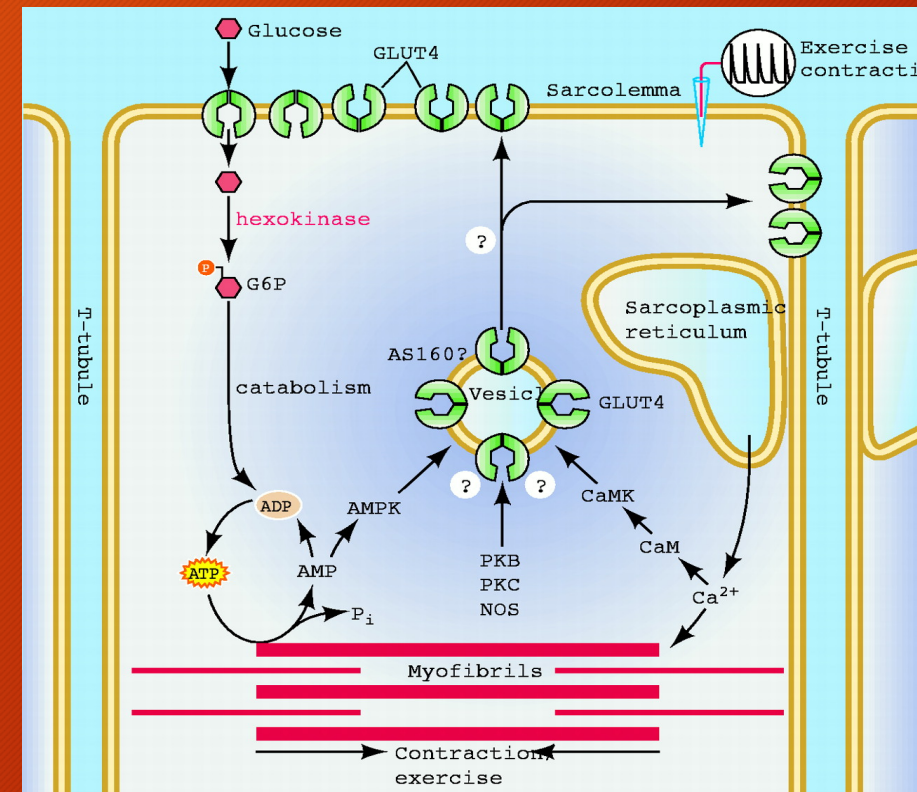
Post exercise hydration

- 1 or 1.5 Times the weight lost through water or rehydration solution
- Protein & Carbs improve rehydration
- Sodium because of sweat loss

Bishop et al, *JSCR* 2008

Energetic recovery

- Insulin sensitivity post exercise
- Glycogen resynthesis post exercise
- 1 to 1.5g/kg of glucose or others simple carbs.
- 0.2 à 0.5g/kg of proteins improve the effects.
- Then 1g/kg/h of carbs in case of sequences of exercise (ex: tournament, tennis, tour de France)

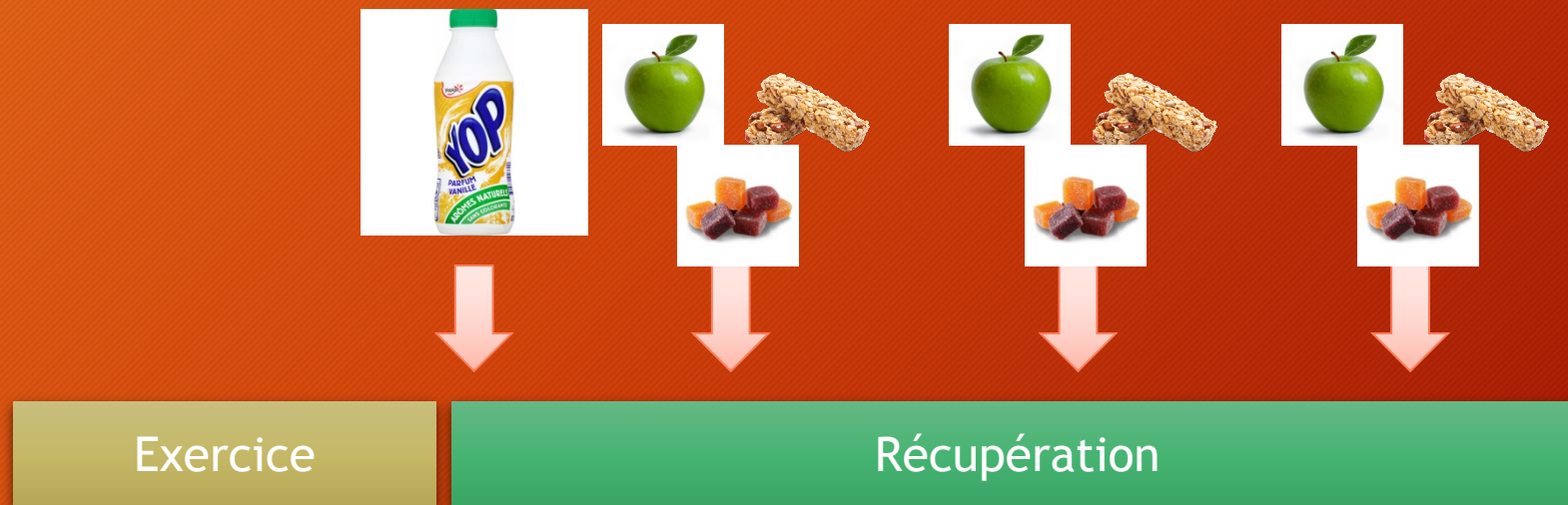


Kerksick et al, 2008

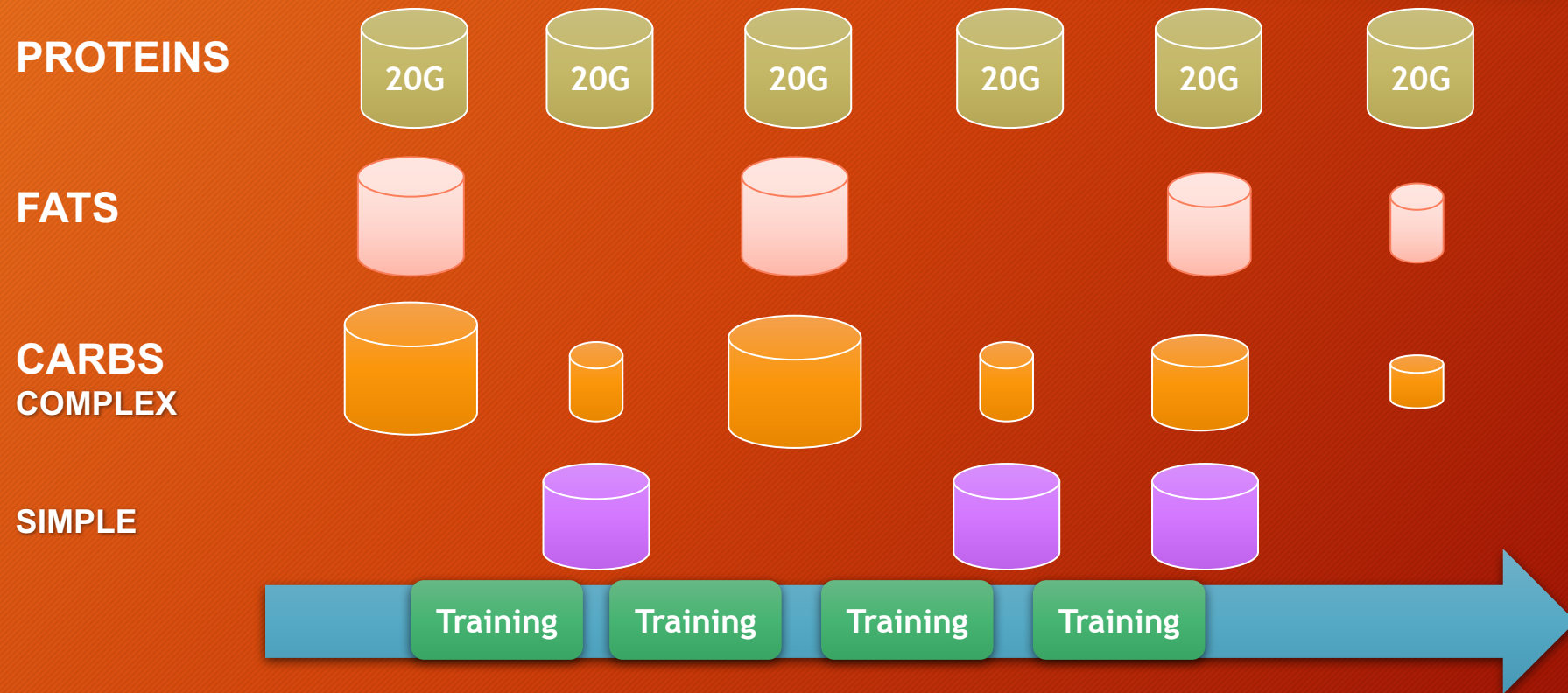
Rose et Richter, 2005

Energetic recovery *exercise sequences*

- 0.5L grape juice + 300g curd (or 1 scoop whey protein)
OU
- 800ml sweet lassie (88g de glucides + 19g de protéines)



Protocol



DRINKS

1,5L to 3-4L depending on the T° and type of Training

	<u>MORNING</u>	<u>MORNING SNACK</u>
Carbohydrate	4 slices of bread with peanut butter + jam	1-2 bananas
Protein	3-4 spoon of oats + honey 3 big spoon of omelet or 4 eggs with yellow	
Milk	1 glass	
Fruits	2 servings + juice	

	<u>LUNCH</u>	<u>AFTERNOON SNACK</u>
Vegetables	Normal fat 3-4 spoons	Protein 2-3 glasses Fruits
Carbohydrate	2 spoons DAL 4 spoons RICE	Fruits Milkshakes
Chicken/Fish	2 spoons or 4 pieces of chicken	OR Curd 2 glasses Fruits 2 servings AND Sandwich/Cake/Fruits 2 pieces

	<u>DINER</u>	<u>OTHERS</u>
Vegetables	Normal fat 3-4 spoons	
Carbohydrate	2 spoons DAL 4 spoons RICE	2 glasses of milk 30 min before bed
Chicken/Fish	2 spoons or 4 pieces of chicken	

HYDRATION

Practical recommendations

Strategy	Details
WUT	First morning weight, urine color, and thirst sensation to guide day-to-day adequacy of water and electrolyte consumption.
Incorporate electrolytes	Rehydrate with meals and include sodium and potassium-rich foods.
Personalize fluid needs	Estimate personal sweat losses from changes in body weight pre- to postexercise.
Train as you compete	Incorporate a competition drinking strategy into training (e.g., using wearable drinking systems as a substitute for water stations).
Improve thermal management	Train during the coolest times of day ^a ; consider indoor air-conditioned training in extreme heat; and consider use of active cooling (e.g., cold towels, cold showers).

Note. W = reduced body weight; U = dark urine color; T = feeling thirsty. ^aExcept when deliberate heat acclimatization is desired.

Basics of recovery

Nutrition

Hydration

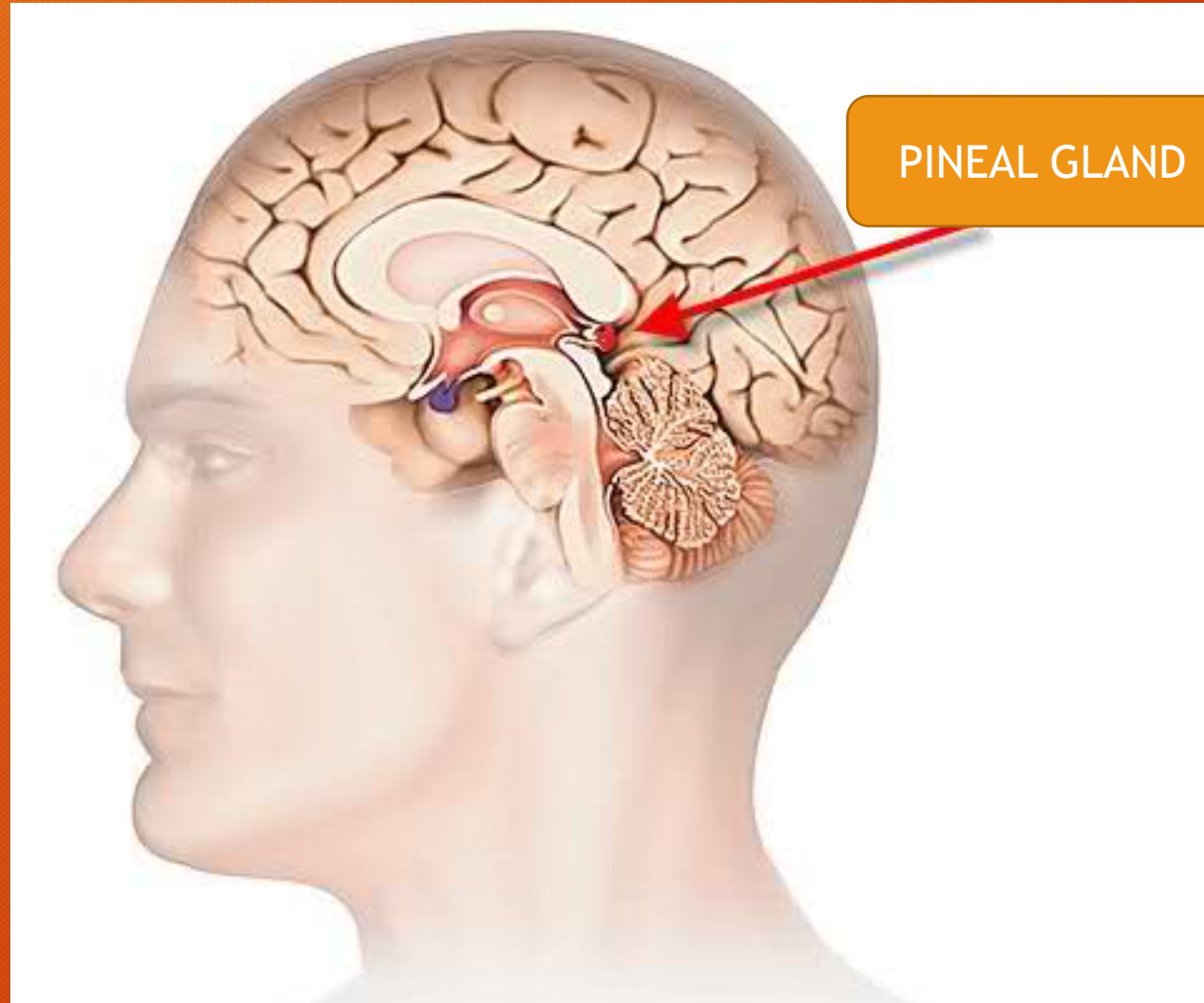
Rest

Sleep

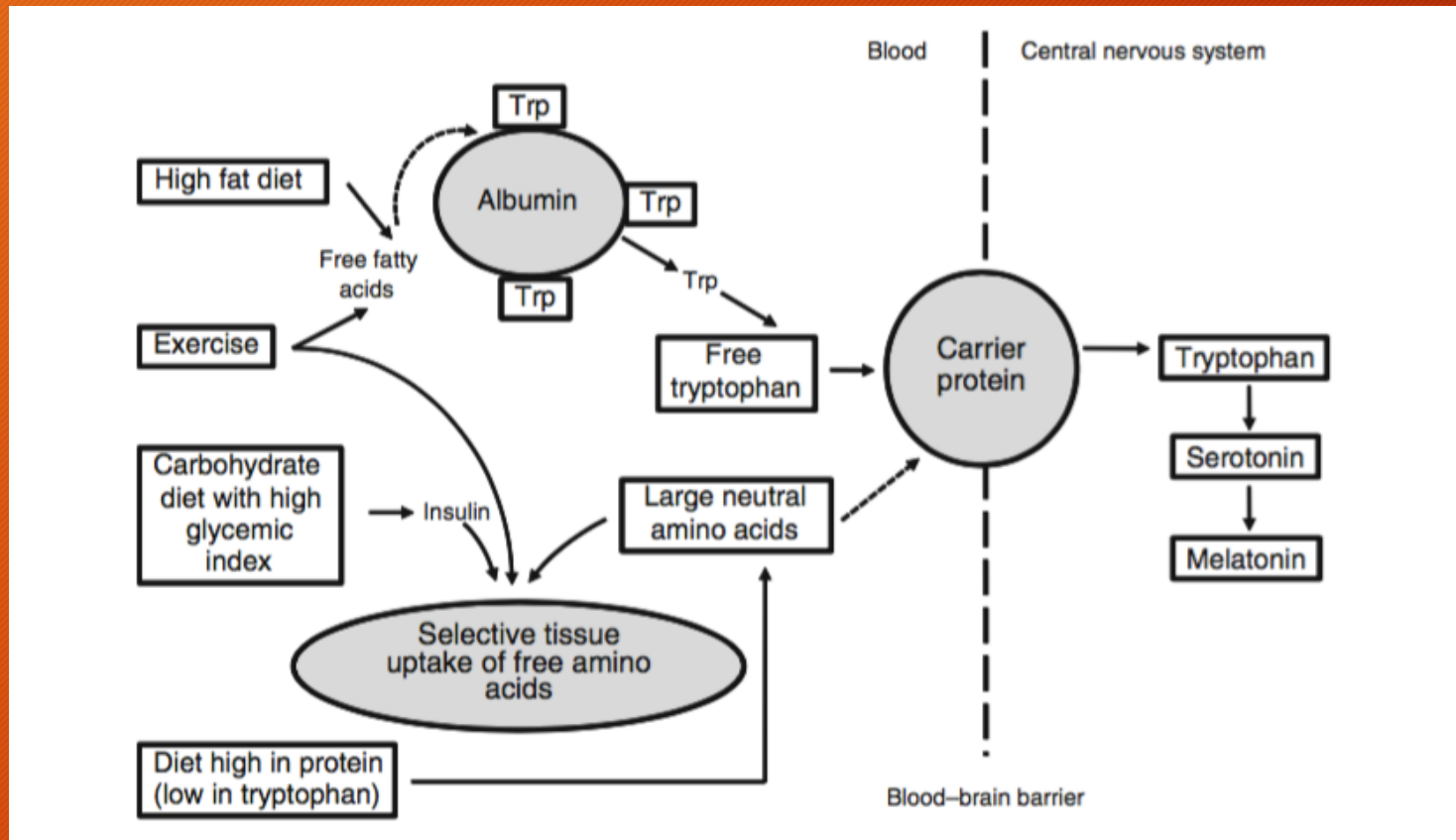
SLEEP

Sleep and Athletes

- Sleep deprivation affect cognitive and physical performance (endurance++).
- Athletes show higher rate of sleep disturbances (up to 50%)
- Two main factors are:
 - Training load and intensity
 - Training schedule (early morning)
- But also:
 - Travels
 - Electronic devices



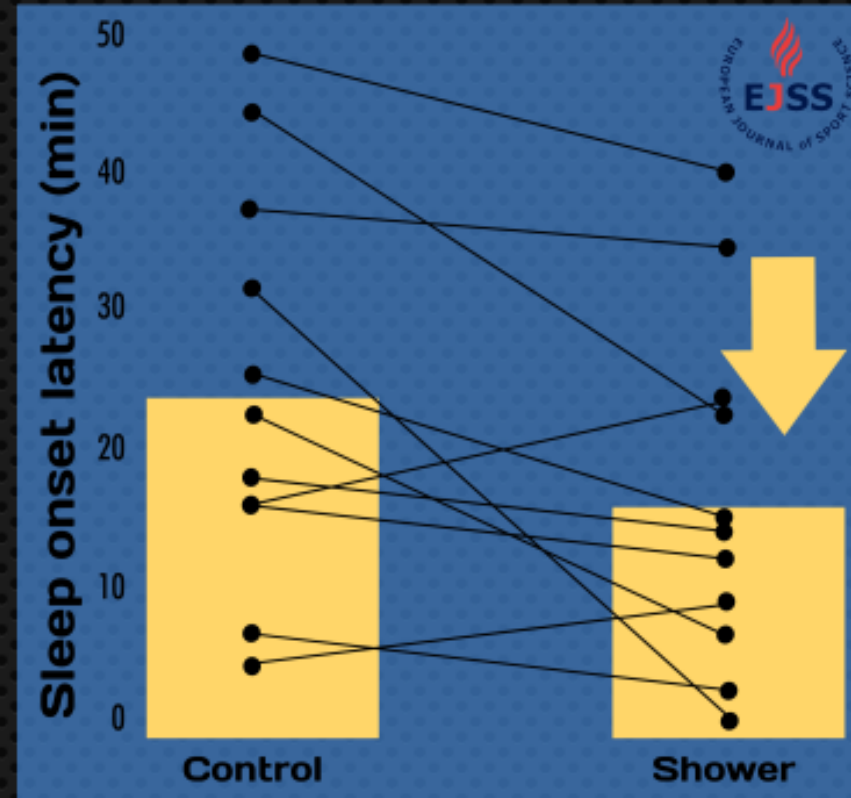
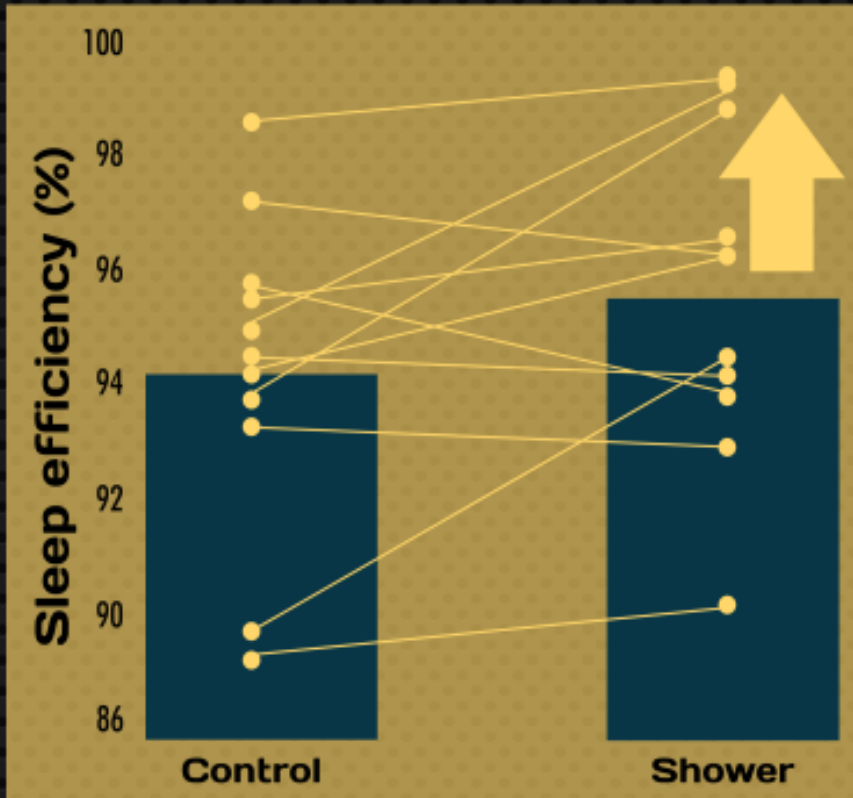
Nutrition and Sleep improvement



A shower before bedtime may improve the sleep onset latency



The current investigation evaluated the effects of 10-min showering at $\sim 40^{\circ}\text{C}$ before lights out within a group of 11 youth soccer players in comparison to normal sleeping conditions (control). Each condition consisted of three days within a randomised crossover trial design



A warm shower performed before lights out may offer a practical strategy to promote thermoregulatory changes that may advance sleep onset latency and improve sleep efficiency in athletes

Reference Whitworth-Turner et al. EJSS 2018

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PRACTICAL STRATEGIES FOR ELITE ATHLETES

SLEEP

Sleep is an essential component of health and well-being, with significant impacts on physical development, emotional regulation, cognitive performance, and quality of life. Along with being an integral part of the recovery and adaptive process between bouts of exercise, accumulating evidence suggests that increased sleep duration and improved sleep quality in athletes are associated with improved performance and competitive success.

STRATEGIES TO IMPROVE SLEEP

ENVIRONEMENT	SCHEDULE	NUTRITION
<ul style="list-style-type: none"> ➤ Avoid physically, emotionally or cognitively stimulating activities late in the evening ➤ No TV, or any other screen at least 1-2h before bed time. ➤ Fresh, comfortable and dark bedroom 1-2h before bed time. ➤ Avoid bright light and noise sources ➤ Implement Jet-Lag strategies 	<ul style="list-style-type: none"> ➤ At least 7h per night or increase sleep time by 15min per day. ➤ Go to bed systematically at the same hour (9-10pm max) ➤ Limit sleep-in on weekends to within 1h of normal weekday wake-up time ➤ Track sleep time (2 weeks) during period of travel or intense training 	<ul style="list-style-type: none"> ➤ Avoid caffeine after 4pm and alcohol. ➤ Avoid too much fat at dinner and increase carbohydrate and/or protein ➤ Based on context see with dietitian or physician for melatonin use ➤ Don't drink too much before sleep ➤ « SLEEP » Snack Ex: hot milk with honey, with dairy product whey protein (20-40g).
DECREASE STRESS AND ANXIETY	SLEEP ROUTINE	INCREASE SLEEP TIME
<ul style="list-style-type: none"> ➤ Do not focus on your need to sleep. ➤ Try not to sleep but simply to relax (use visualisation, deep breathing or meditation). ➤ Choose a comfortable position. ➤ Do a pleasant intellectual activity (drawing, reading, writing) 	<ul style="list-style-type: none"> ➤ Keep the same actions in the same order everyday : <ul style="list-style-type: none"> ○ Hot shower or bath ○ Relaxation exercises or stretching ○ Reading ○ Relaxing music <p style="text-align: center;"><i>Copyright Dr Kevin CAILLAUD</i></p>	<ul style="list-style-type: none"> ➤ <u>NAP</u> Regular 15-30 min NAPs if it's possible <u>in the beginning</u> of the afternoon. ➤ <u>SLEEP EXTENSION</u> When necessary increase nocturnal time by at least 30 min or implement a 1-2h post training NAP in the morning.

Recovery technics

Basics of recovery

Nutrition

Hydration

Rest

Sleep

• <48H

- CRYOTHERAPY
- ELECTROSTIMULATION
- COMPRESSION GARMENTS

>48H

- ~~CRYOTHERAPY~~
- ELECTROSTIMULATION
- COMPRESSION GARMENTS

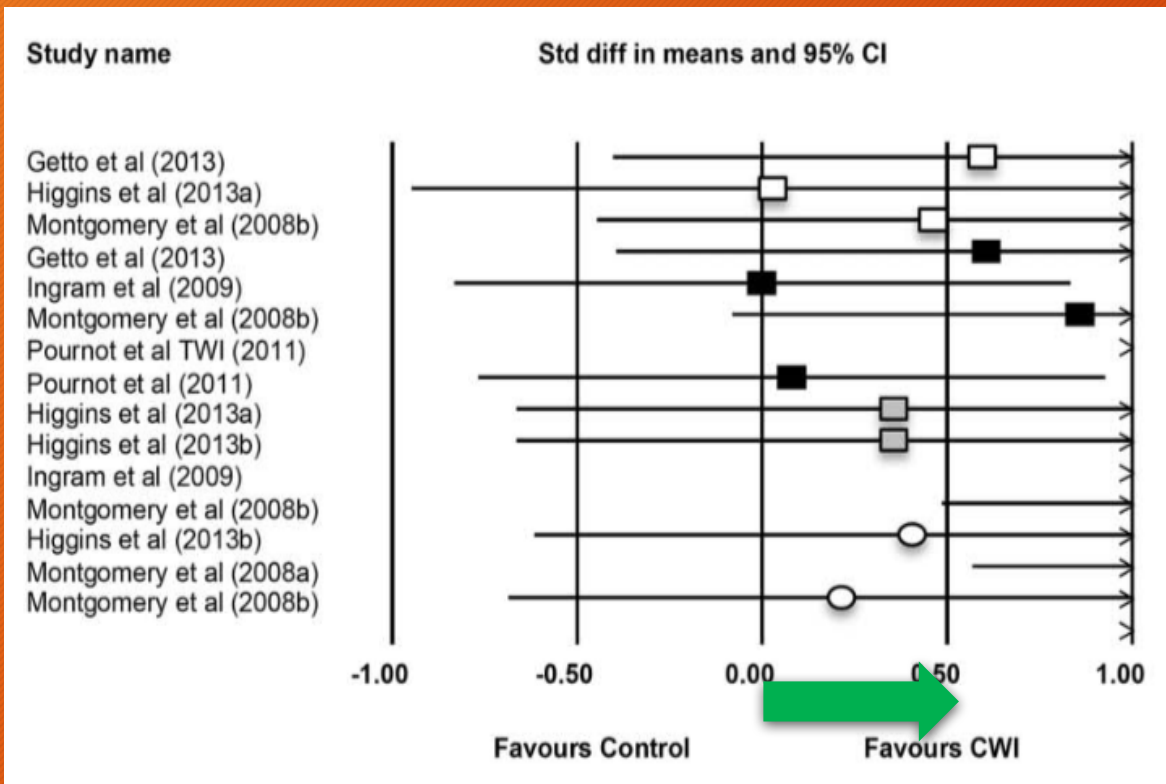
WHAT HAPPEN AT IIS

1. Periodization of Ice Bath
2. Removal of Sauna from the recovery process

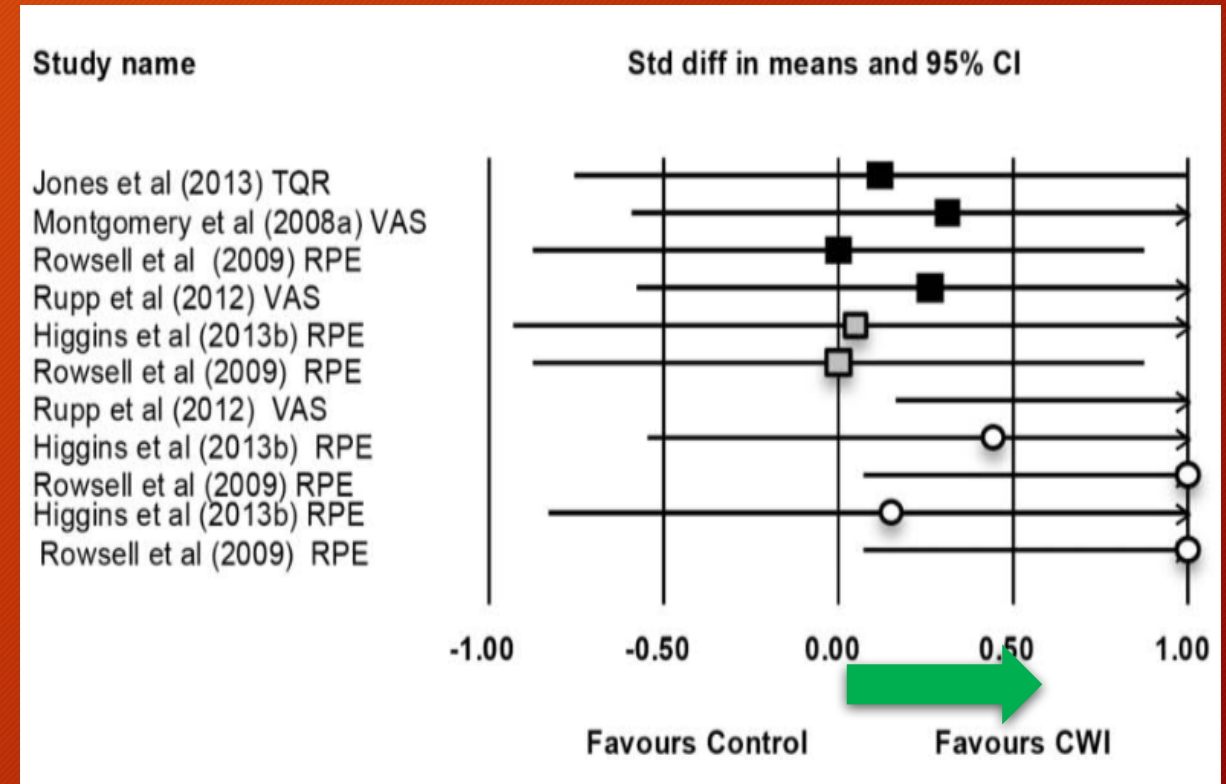
Ice Bath Periodization

Effectiveness for recovery in the acute phase

Muscle Soreness

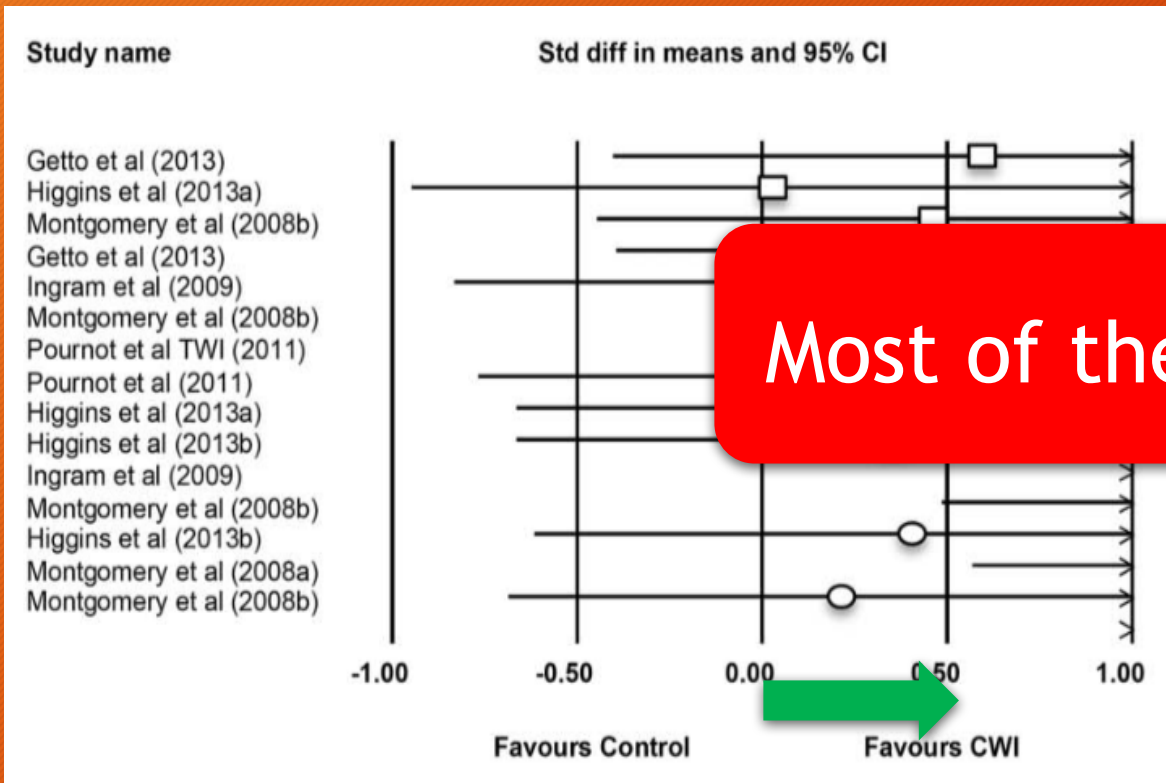


Fatigue

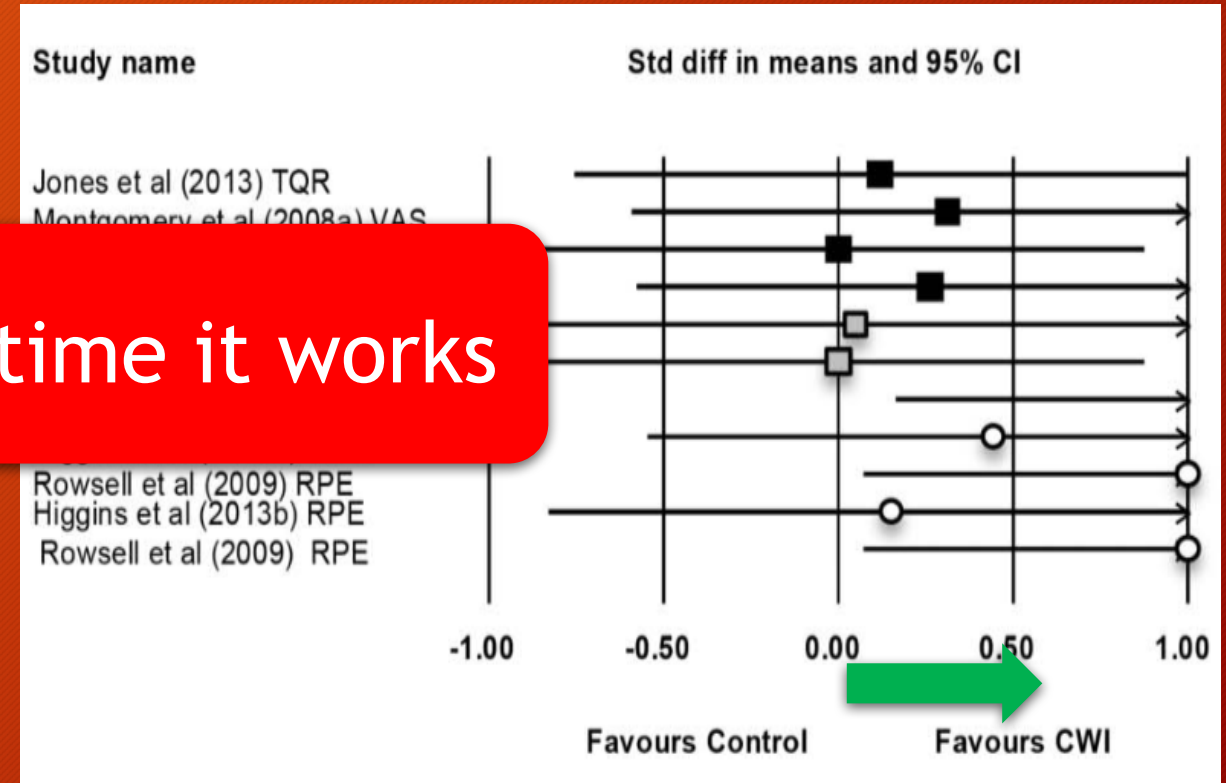


Effectiveness for recovery in the acute phase

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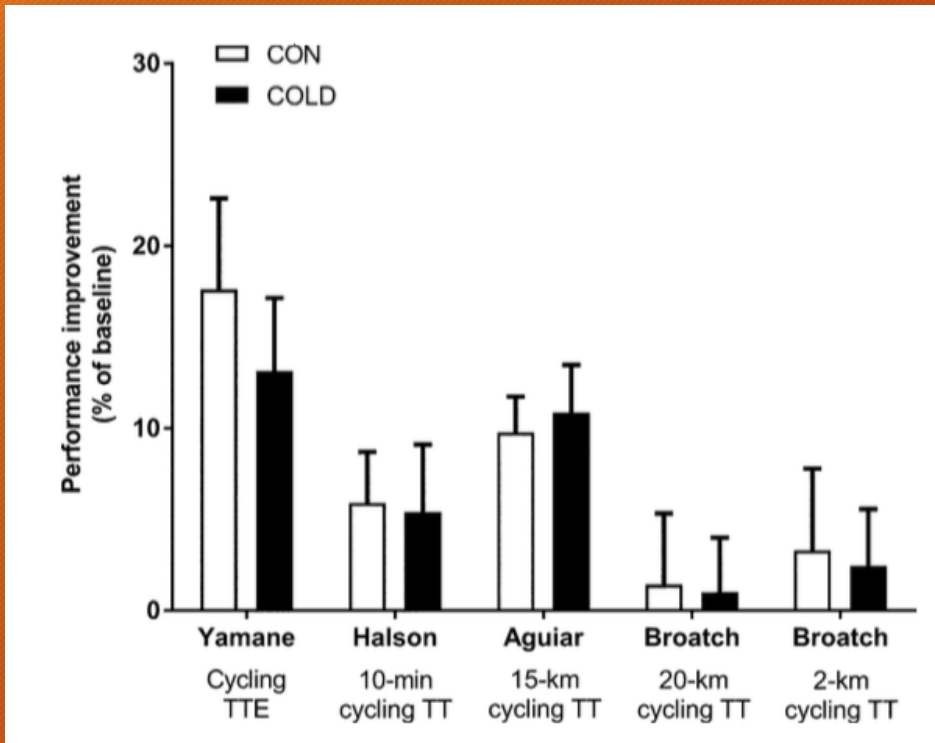


Fatigue

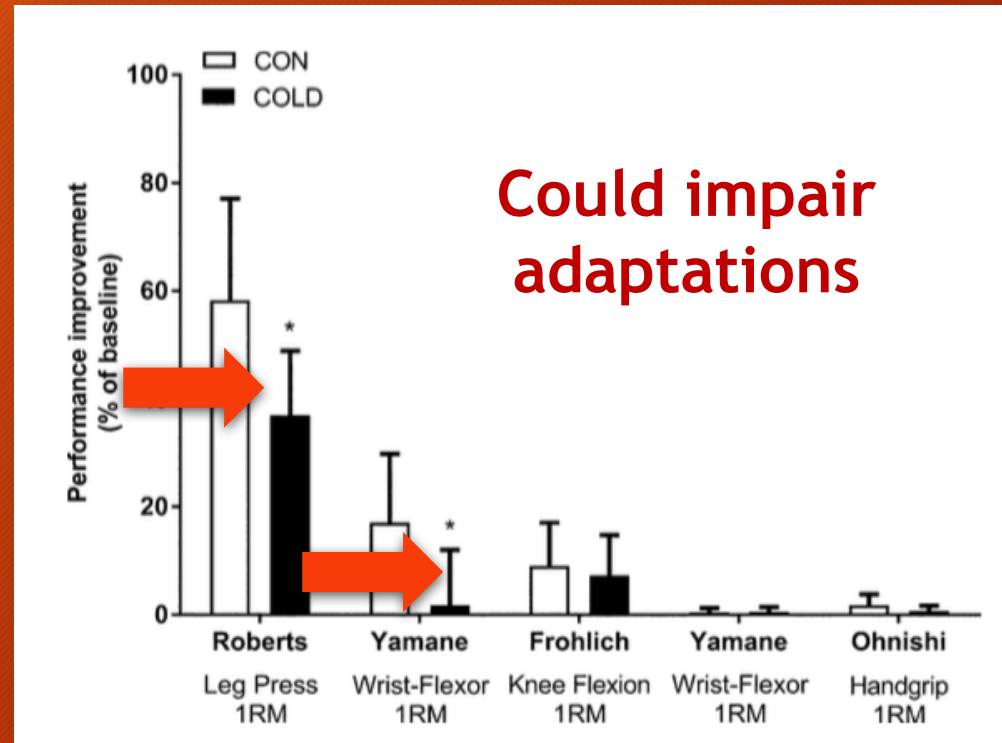


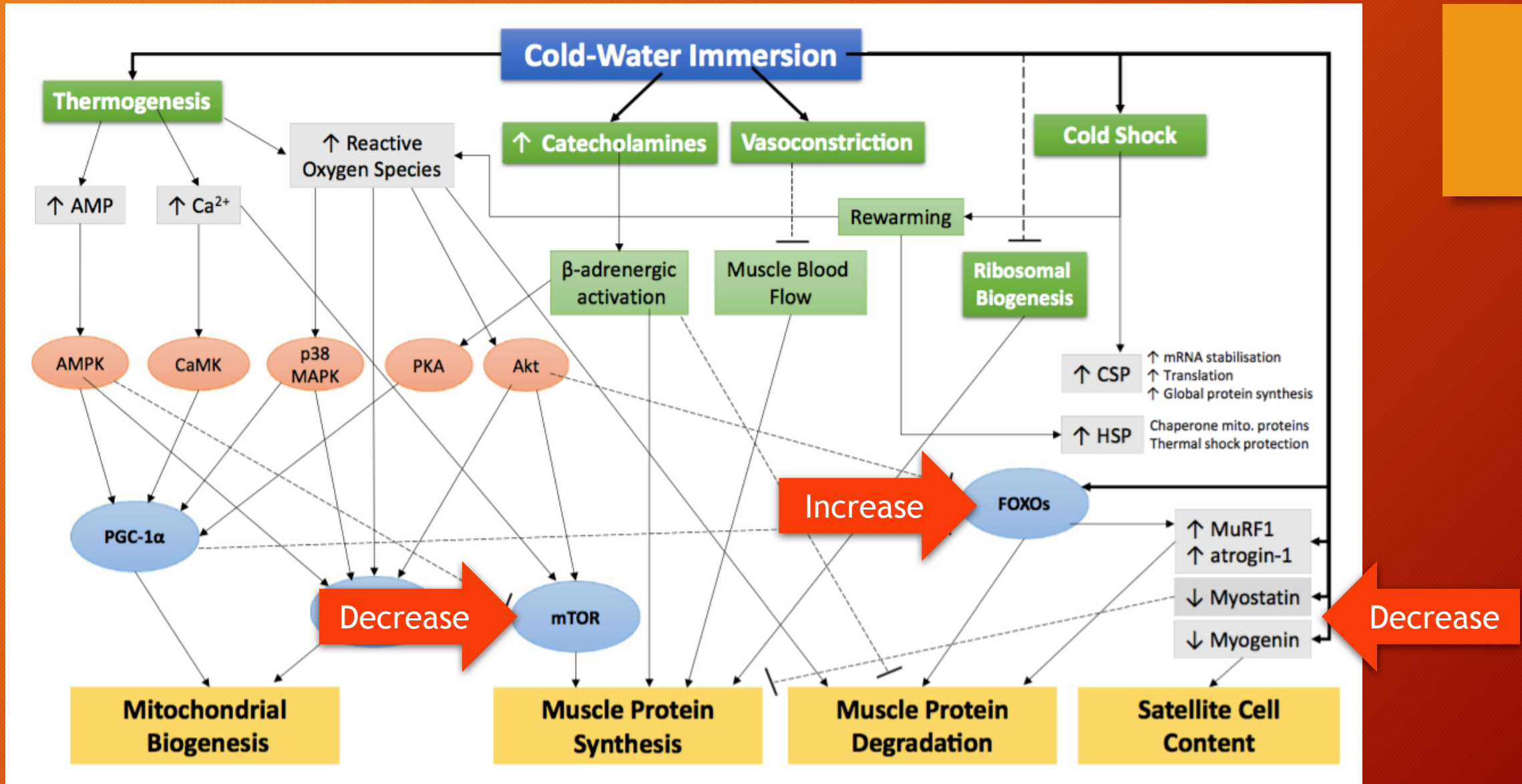
But differential effects in a chronic view

Endurance



Strength





Evidence based CWI/CWT goals for elite athletes.

1. To maximize adaptation to training:

Withholding recovery at certain times, most commonly in the general preparation phase (*chronic recovery*).

2. To prepare for certain training sessions:

Utilizing recovery during the specific preparation phase (acute recovery).

Evidence based CWI/CWT goals for elite athletes.

3. To decrease fatigue during the competition phase:

Utilizing increased recovery (acute recovery).

4. During particular periods:

Incorporating recovery during travel, recovery from injury or in case of psychological stress (acute and chronic recovery).

Fatigue Symptoms

Detectable during everyday routine

GENERAL

- Persistent DOMS
- Frequent infections
- Morning Hypotension
- Performance decrement
- Anxiety
- Lack of concentration

PARASYMPATHETIC

(High Volume)

- Depression
- Fatigue
- Sleepiness
- Loss of motivation

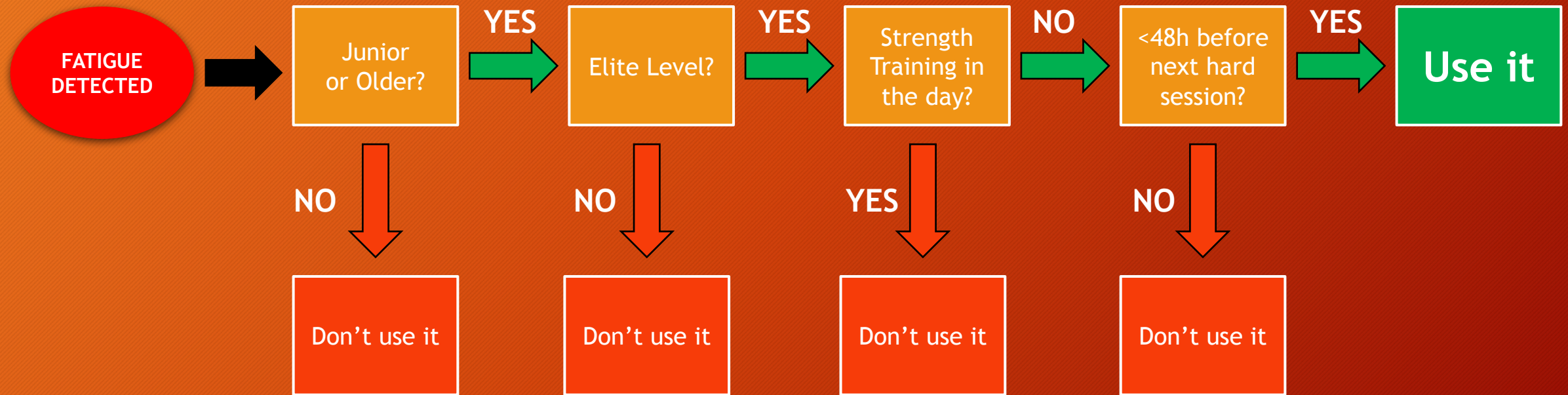
SYMPATHETIC

(High intensity)

- Irritability
- Insomnia
- Decreased appetite
- Restlessness

ICE BATH or CONTRAST WATER THERAPY

Flow chart to guide informed decision making



***NB:** In particular case such as Chronic fatigue syndrom (**Overreaching** or **Overtraining**) it can be use outside this flow chart. In such cases, please contact the physiology team.*

SAUNA ISN'T RECOVERY

Table 1. Acute Physiological Effects of Sauna Bathing

Effect	Direction	Magnitude	References
Skin temperature	↑	Within a few minutes up to 40°C	(5,9,13,14)
Rectal temperature	↑	By 0.2°C at 72°C for 15 minutes By 0.4°C at 92°C for 20 minutes By 1.0°C at 80°C for 30 minutes	(15) (16) (17)
Sweating	↑	Sweat is secreted at a rate of 0.6 to 1.0 kg/hour at 80° to 90°C, with an average total secretion of 0.5 kg during a typical sauna bath	(6,9,18)
Skin blood flow	↑	From 5%–10% to 50%–70% of cardiac output (from about 0.5 to 7 L/minute)	(12)
Blood flow to internal organs	↓	Renal blood flow is decreased by 0.4 L/minute Splanchnic blood flow is decreased by 0.6 L/minute	(12)
Blood flow to muscles	↓	By 0.2 L/minute	(12)
Heart rate	↑	Up to 100 beats per minute during moderate sauna bathing in accustomed subjects Up to 150 beats per minute during intense sauna bathing or in unaccustomed subjects	(9,27,29,31,49,83,115) (20,35,83,116)
Cardiac output	↑	From 5–6 L/minute up to 9–10 L/minute	(10,12,19)
Cardiac stroke volume		Unchanged	(12,19)
Systolic blood pressure		Unchanged Or decreased by 8 to 31 mm Hg Or increased by 9 to 21 mm Hg	(17,20,27,49,83) (19,21,29,31,35) (20,27,83,116,117)
Diastolic blood pressure		Unchanged Or decreased by 6 to 39 mm Hg	(27,31) (17,19–21,29,35,49,83,116,117)

↑ = increased; ↓ = decreased.

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IT MEANS

- LESS absorptive capacity for NUTRIENTS.
- LESS nutrients to the MUSCLES.
- An exercise bout for the cardiovascular system.

Activation of stress-related genes

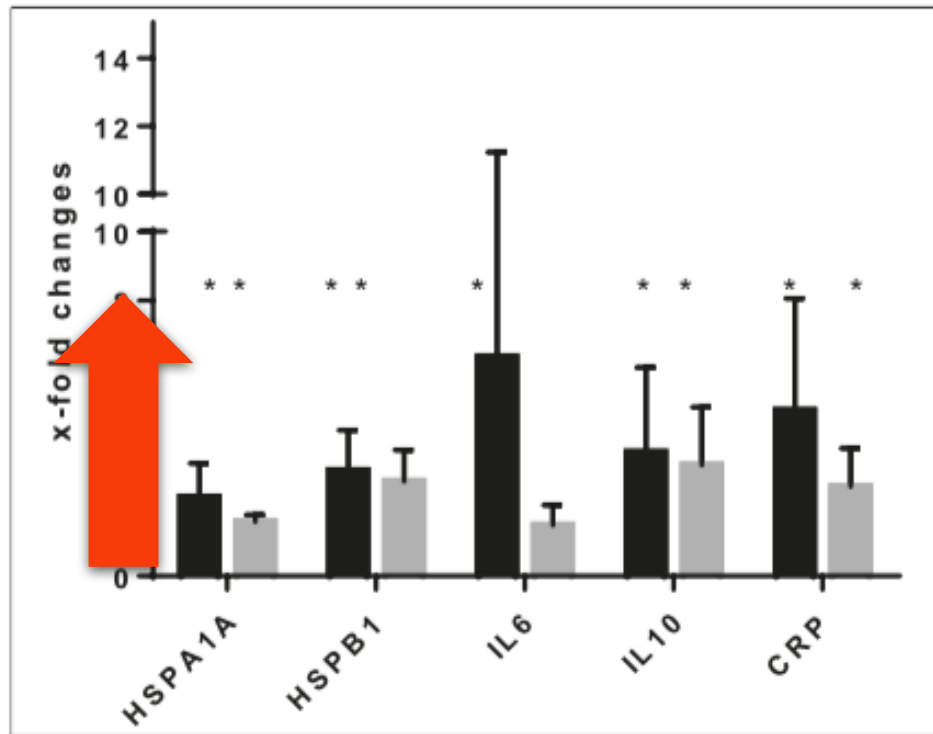
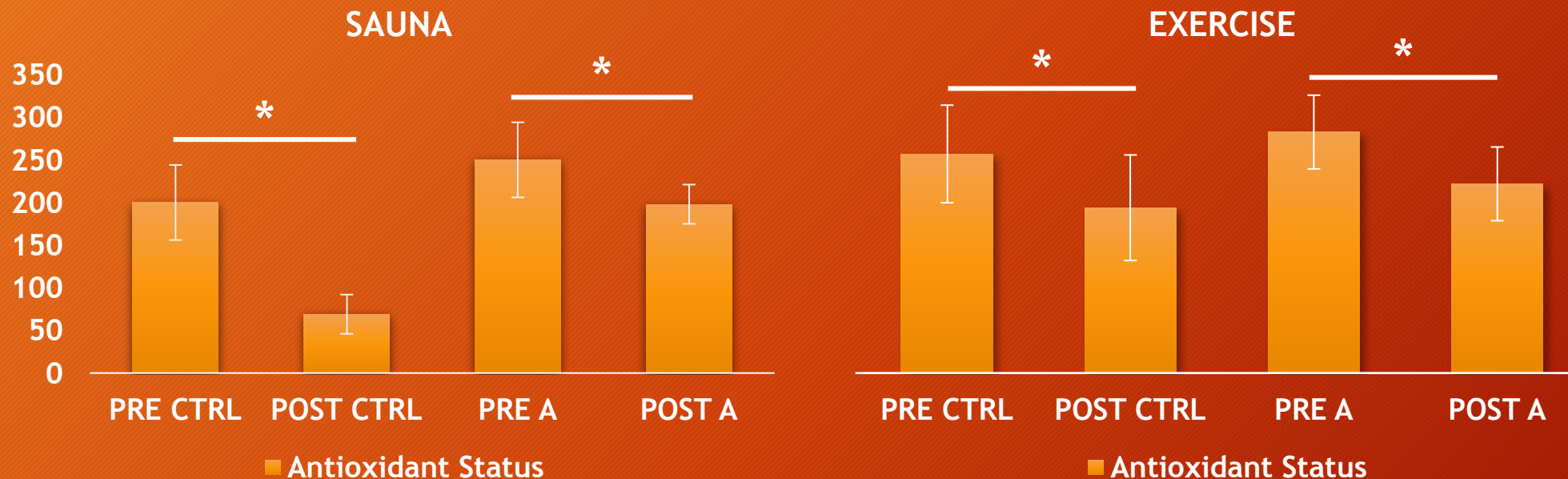


Figure 1. x-fold changes in expression of tested genes in the non-athletes (black bars) and athletes (gray bars). x-fold changes was calculated as: relative expression after sauna/relative expression before sauna

Protocol:
2X15 min at 98°C
with 5 min break (cool shower)

Results:
Increase all the stress parameters measured.

Disturbances in Oxidant Balance: *antioxidant*



Protocol:

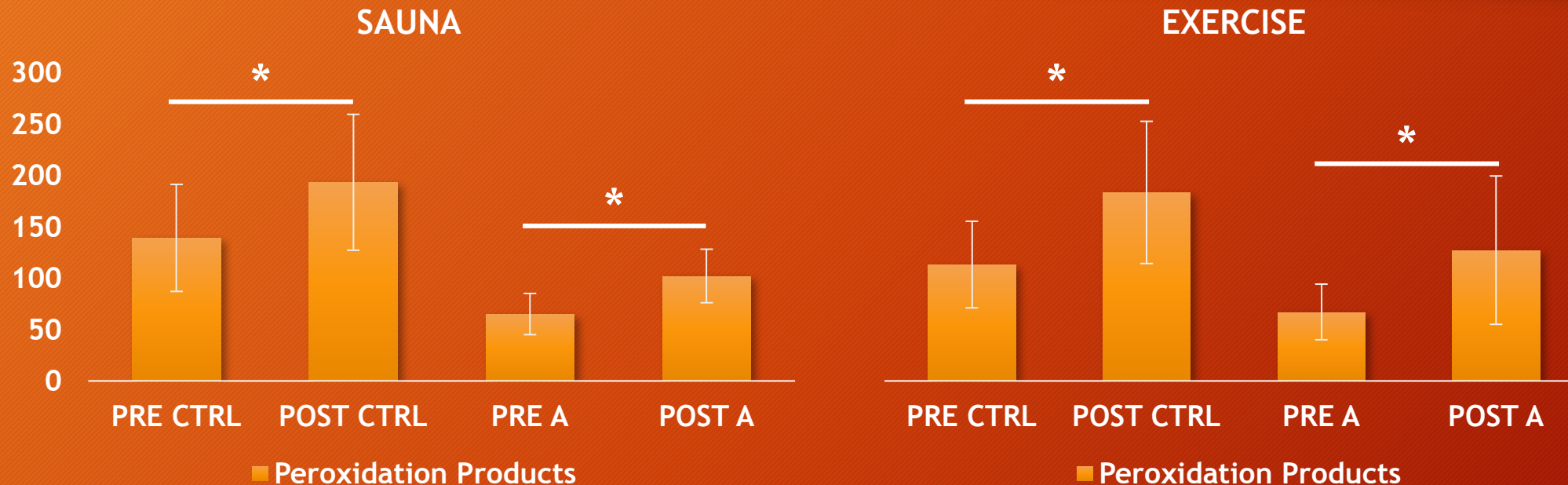
Sauna = 15min 96° C + 2min shower (20° C)

Exercise = 53% VO₂max

➤ Until rectal T° = + 1,2° C

Pilch et al. PLOS one 2014

Disturbances in Oxidant Balance: *pro-oxidant*



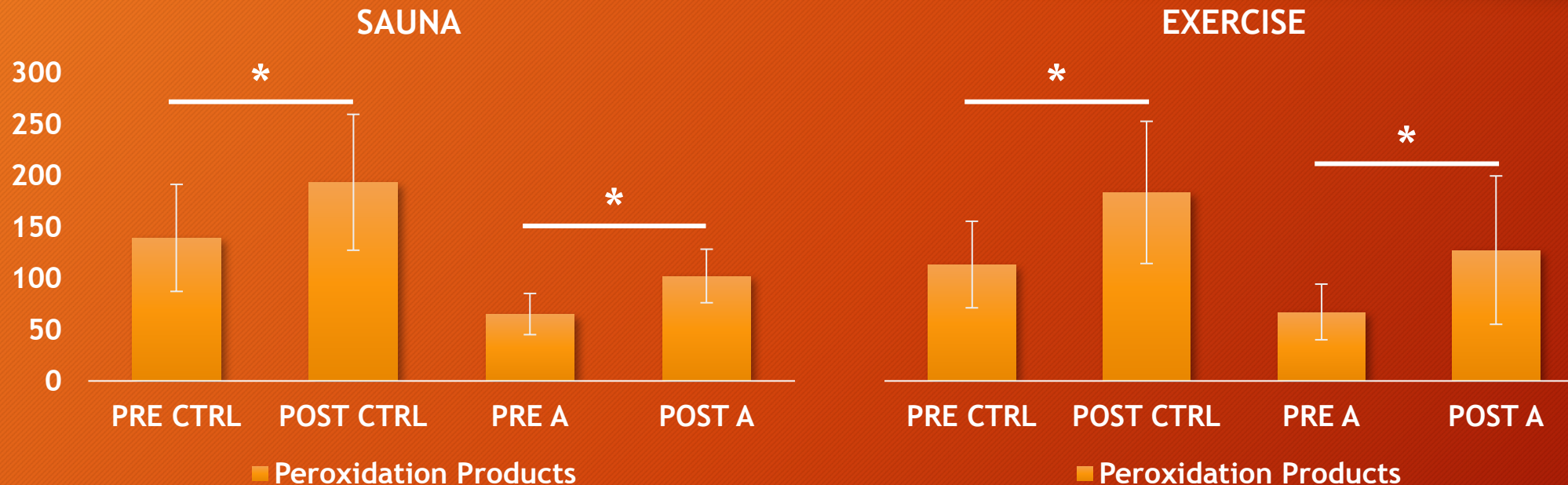
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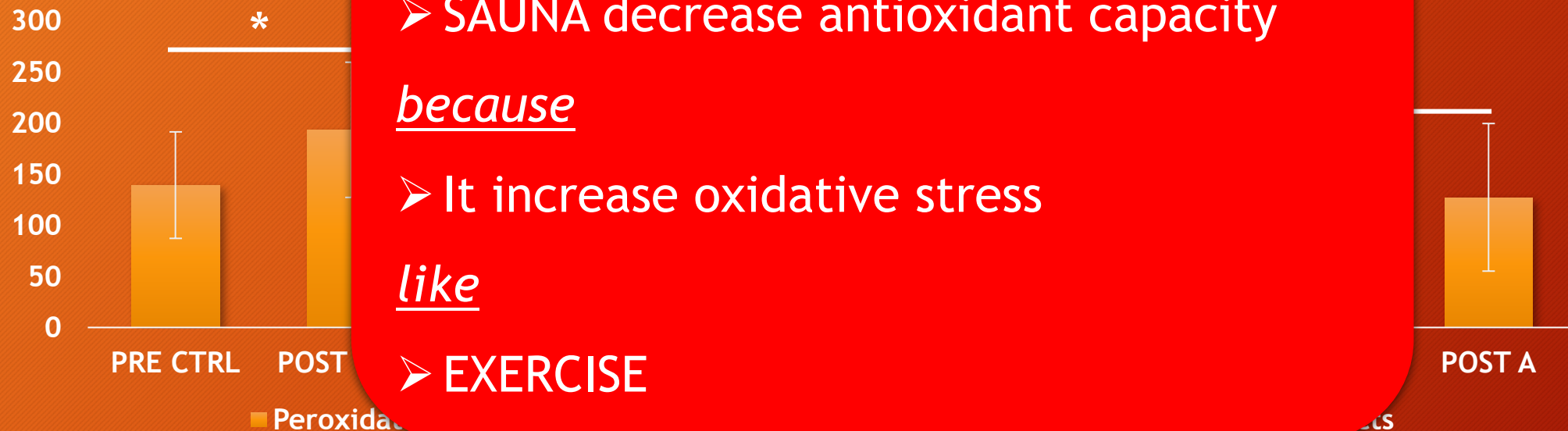
➤ SAUNA decrease antioxidant capacity

because

➤ It increase oxidative stress

like

➤ EXERCISE



Protocol:

Sauna = 15min 96° C + 2min shower (20° C)

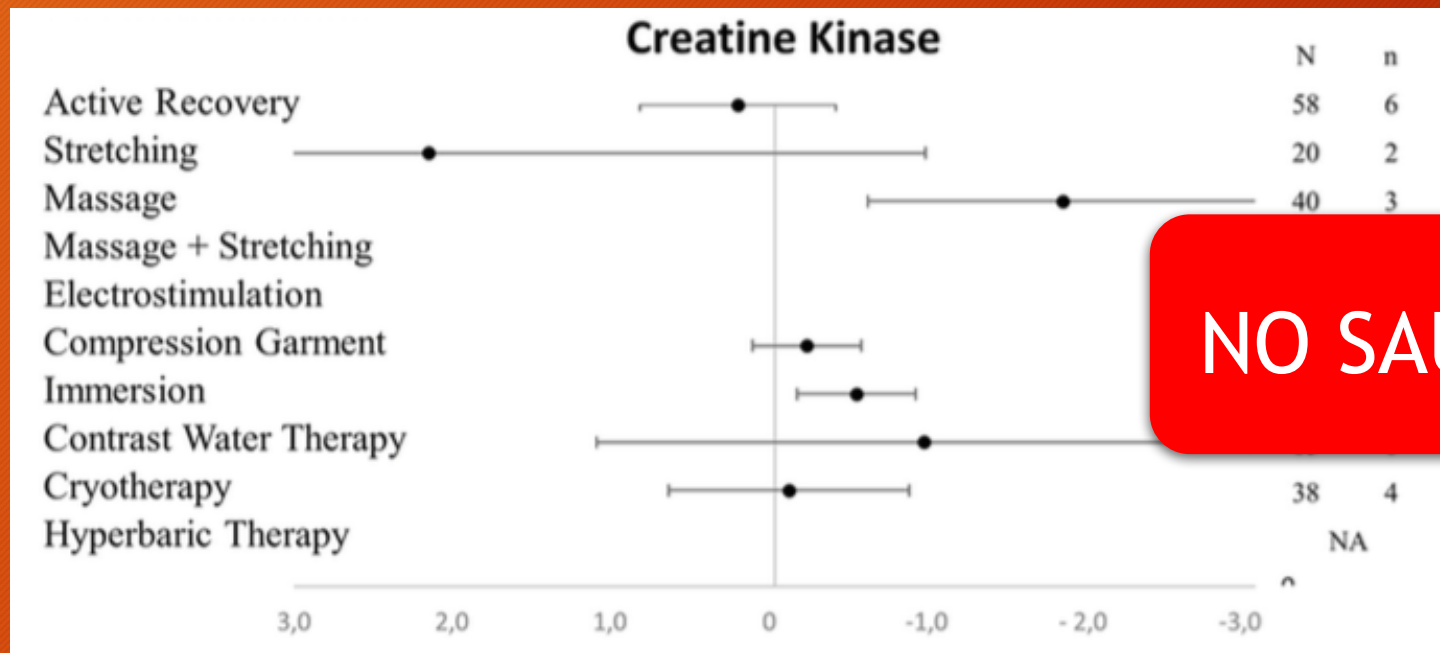
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That's WHY: *even in a meta-analysis ...*

An Evidence-Based Approach for Choosing Post-exercise Recovery Techniques to Reduce Markers of Muscle Damage, Soreness, Fatigue, and Inflammation: A Systematic Review With Meta-Analysis.

Dupuy et al. *Frontiers Physiol* 2018



NO SAUNA in the list

TAKE HOME

- MAKE SURE YOU HAVE A PLAN FOR TRAINING BUT FOR RECOVERY ALSO
- BE SURE YOU GET ENOUGH ENERGY, PROTEIN AND MICRONUTRIENTS
- SPREAD PROTEIN THROUGHOUT THE DAY IN 4-6 BOLUS
- STAY WELL HYDRATED BY CHECKING YOUR URINE AND THIRST
- GET ENOUGH SLEEP AND PUT IN PLACE A SLEEP ROUTINE
- USE STRATEGICALLY THE EFFECTIVE RECOVERY TECHNIQUES
- DON'T USE SAUNA FOR RECOVERY IT DOESN'T HELP