ASPC
ASSOCIATION OF SPORT PERFORMANCE CENTRES

XIV INTERNATIONAL FORUM ON ELITE SPORT HELSINKI 2025

Road to LA 2028: How we bridge science and sport in Finland

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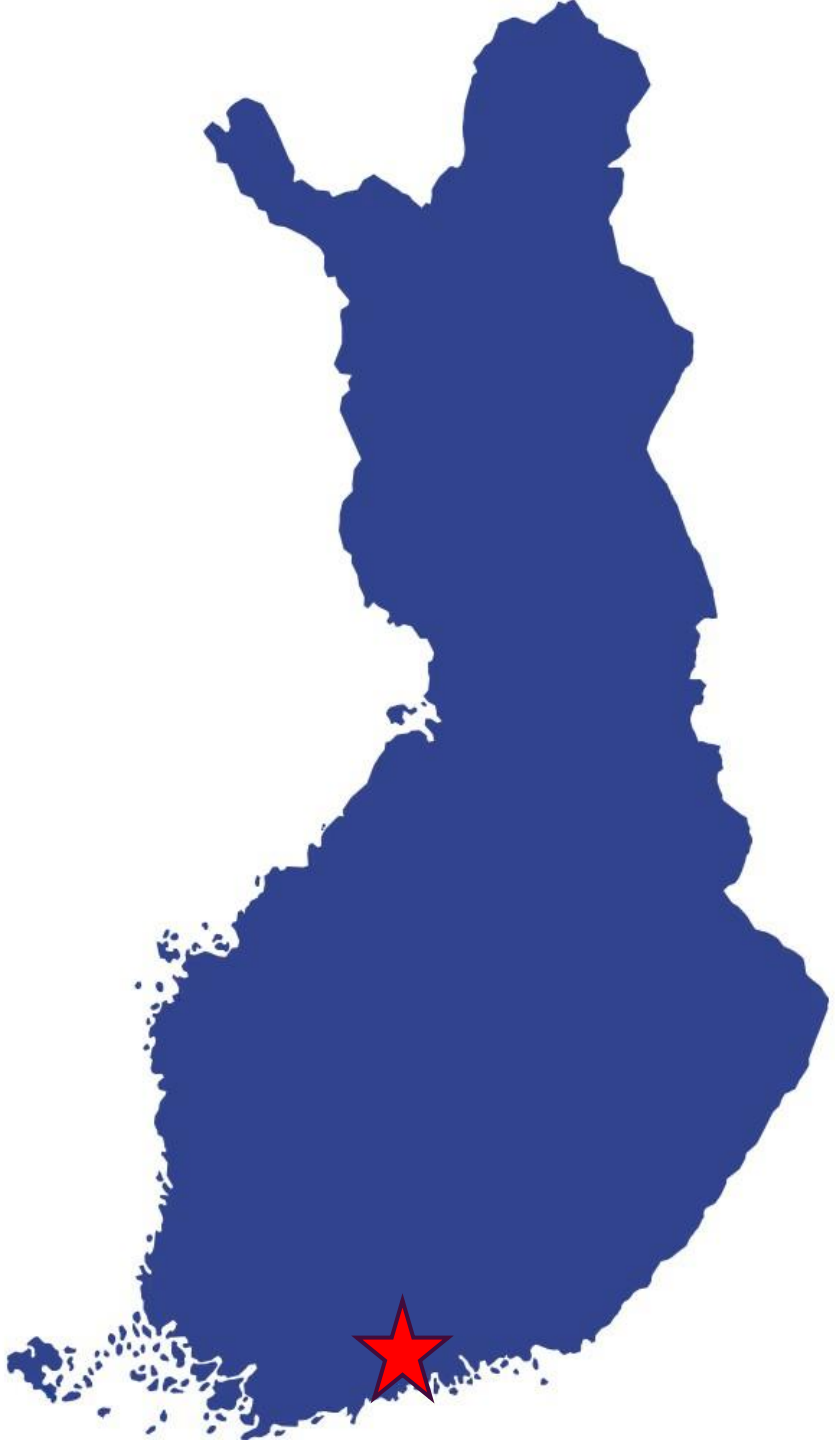
Huippu-urheilun instituutti – KIHU
Finnish Institute of High Performance Sport

JYVÄSKYLÄ

Helsingin urheilulääkäriasema - HULA
Helsinki Clinic for Sport and Exercise Medicine

HELSINKI

hula.fi @helsinginurheilulaakariasema

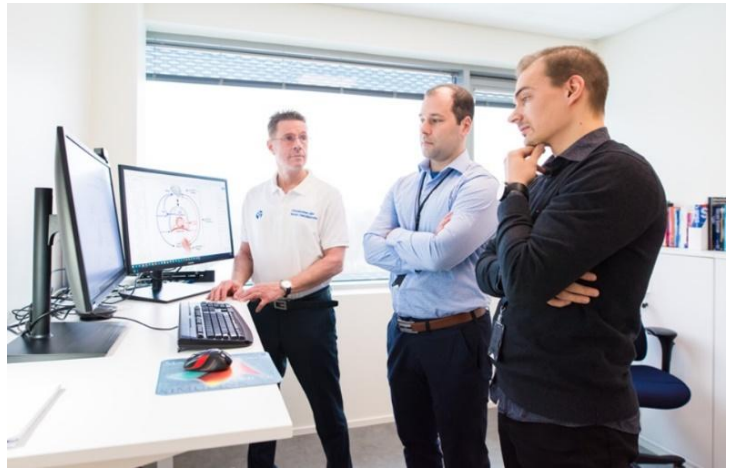



URHEA
HELSINGIN URHEILULÄÄKÄRIASEMA


URHEA

Sport Medicine Services

Research and Development



Education

Medical Training


TOKYO 202
adidas

Sää

Yli 30 asteen hellepäiviä on ollut nyt 20 putkeen

Ennätyksellinen helleputki on saanut jatkoa.

EP2 FINLAND

ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM

HULA - Helsingin urheilulääkäriasema
Urheilulääketieteen säätiö sr

OLYMPIAVALMENNUSKESKUS
Helsinki

OLYMPIAVALMENNUSKESKUS
Vuokatti-Ruka

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

URHEA

Pajulahti

KIHU

kisakallio

KOLMEN KAMPUKSEN URHEILUOPISTO

Urheiluopistosäätiö

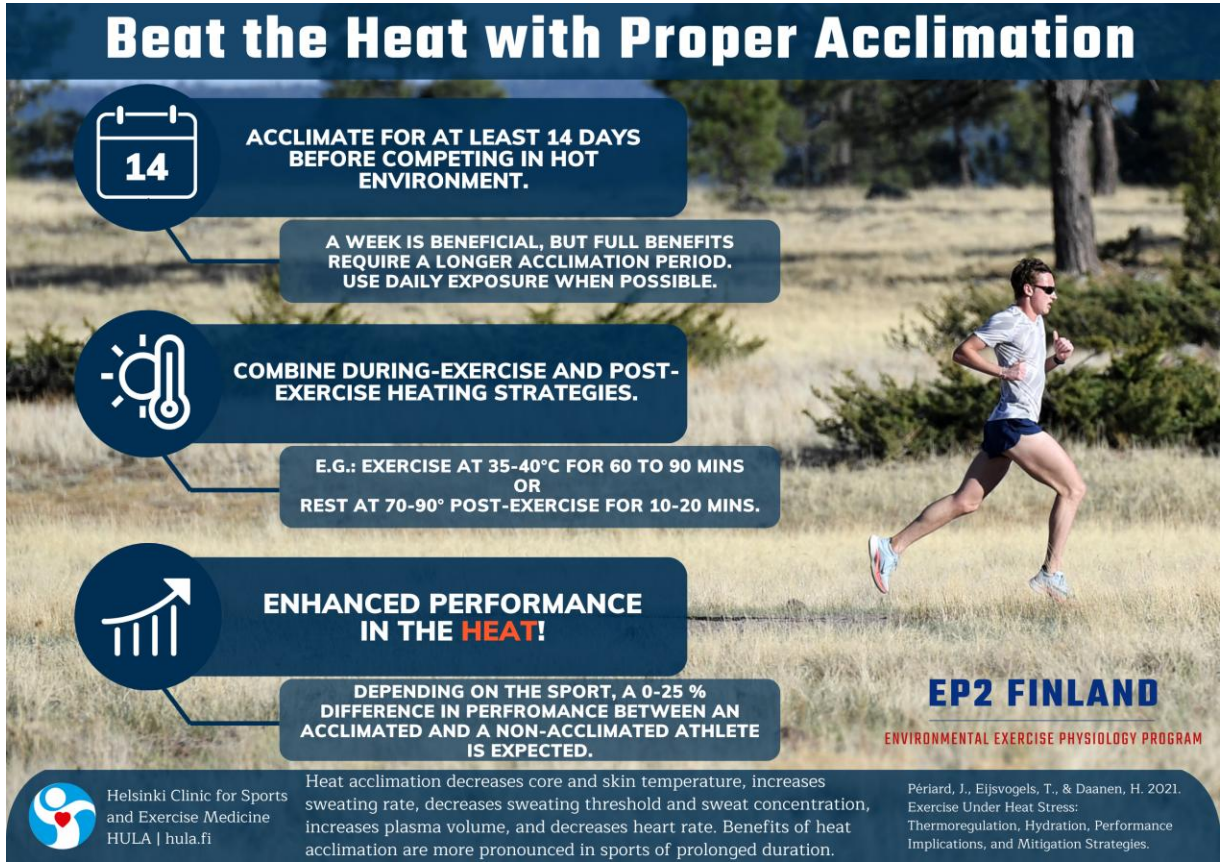
Suomen Kulttuurirahasto

Opetus- ja kulttuuriministeriö

hula.fi

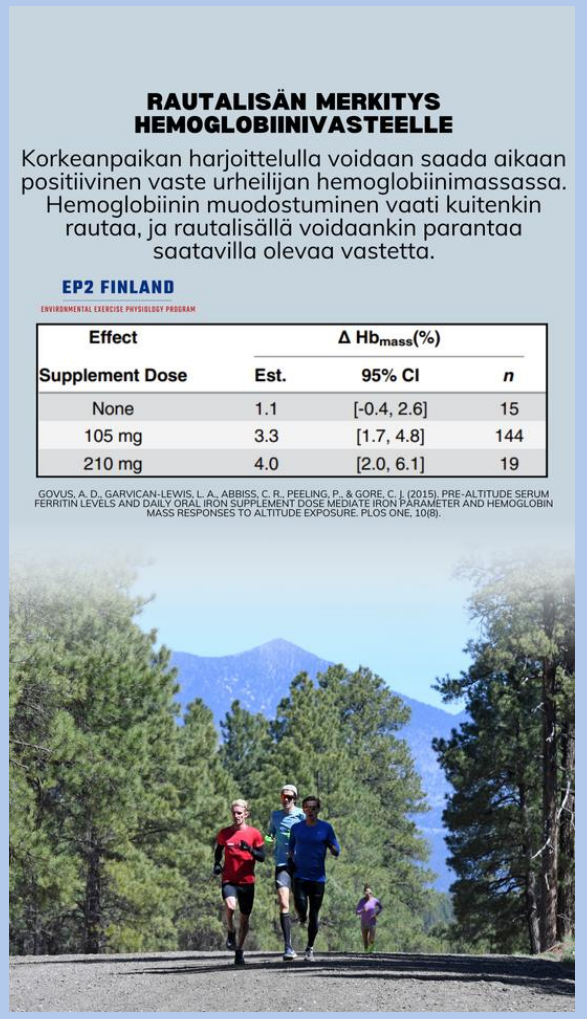
@helsinginurheilulaakariasema

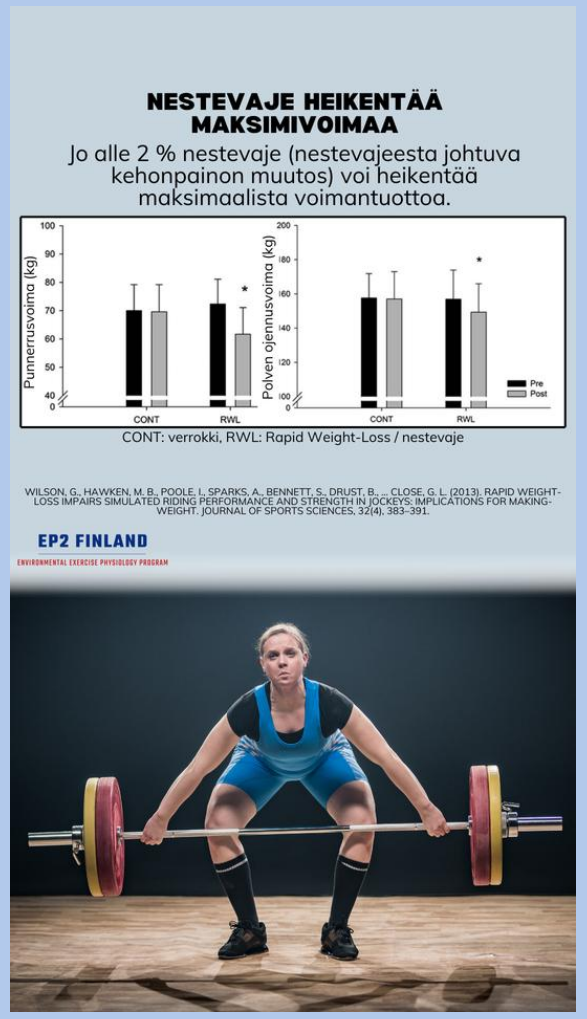
Infographics

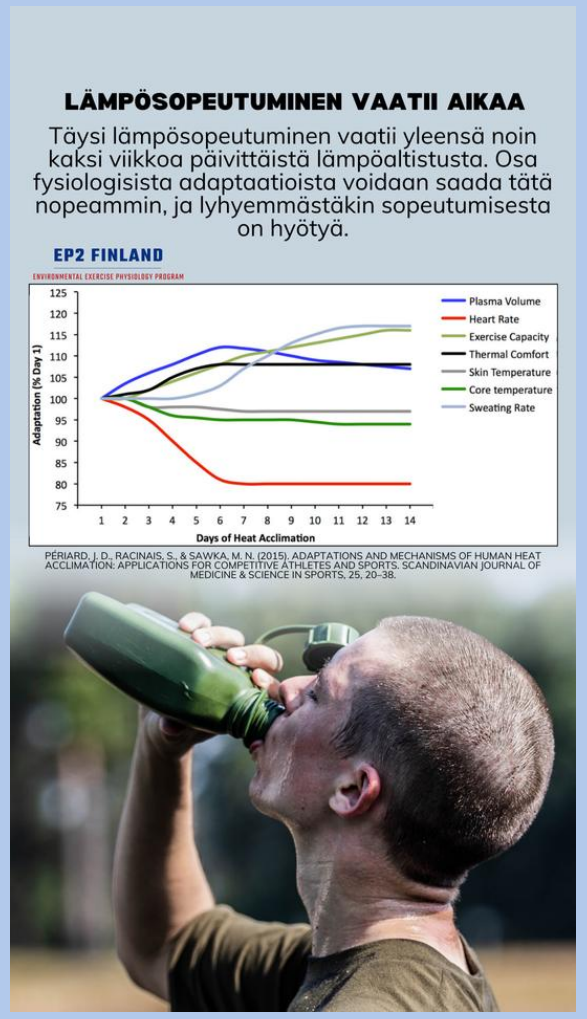


INSTAGRAM


EP2 FINLAND
ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM
UUSI ARTIKKELIMME MIESTEN JA NAISTEN VÄLISISTÄ EROISTA KUUMASSA ON JULKAISTU!


RAUTALISÄN MERKITYS HEMOGLOBIINIVASTEELLE
Korkeanpaikan harjoittelulla voidaan saada aikaan positiivinen vaste urheilijan hemoglobiinimassassa. Hemoglobiinin muodostuminen vaati kuitenkin rautaa, ja rautalisällä voidaankin parantaa saatavilla olevaa vastetta.
EP2 FINLAND
ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM
Effect
Δ Hbmass(%)
Supplement Dose
Est.
95% CI
n
None 1.1 [-0.4, 2.6] 15
105 mg 3.3 [1.7, 4.8] 144
210 mg 4.0 [2.0, 6.1] 19
GOVUS, A. D., GARVICAN-LEWIS, L. A., ABBISS, C. R., PEELING, P., & GORE, C. J. (2015). PRE-ALTITUDE SERUM FERRITIN LEVELS AND DAILY ORAL IRON SUPPLEMENT DOSE MEDIATE IRON PARAMETER AND HEMOGLOBIN MASS RESPONSES TO ALTITUDE EXPOSURE. PLOS ONE, 10(8).


NESTEVAJE HEIKENTÄÄ MAKSIMIVOIMAA
Jo alle 2 % nestevaje (nestevajeesta johtuva kehonpainon muutos) voi heikentää maksimaalista voimantuottoa.
Punnerrusvoima (kg)
Polven ojennusvoima (kg)
CONT
RWL
Pre
Post
CONT: verrokki, RWL: Rapid Weight-Loss / nestevaje
WILSON, G., HAWKEN, M. B., POOLE, I., SPARKS, A., BENNETT, S., DRUST, B., ... CLOSE, G. L. (2013). RAPID WEIGHT-LOSS IMPAIRS SIMULATED RIDING PERFORMANCE AND STRENGTH IN JOCKEYS: IMPLICATIONS FOR MAKING-WEIGHT. JOURNAL OF SPORTS SCIENCES, 32(4), 383–391.
EP2 FINLAND
ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM


LÄMPÖSOPEUTUMINEN VAATII AIKAA
Täysi lämpösopeutuminen vaatii yleensä noin kaksi viikkoa päivittäistä lämpöaltistusta. Osa fysiologisista adaptaatioista voidaan saada tätä nopeammin, ja lyhyemmästäkin sopeutumisesta on hyötyä.
EP2 FINLAND
ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM
Adaptation (% Day 1)
Days of Heat Acclimation
Plasma Volume
Heart Rate
Exercise Capacity
Thermal Comfort
Skin Temperature
Core temperature
Sweating Rate
PÉRIARD, J. D., RACINAIS, S., & SAWKA, M. N. (2015). ADAPTATIONS AND MECHANISMS OF HUMAN HEAT ACCLIMATION: APPLICATIONS FOR COMPETITIVE ATHLETES AND SPORTS. SCANDINAVIAN JOURNAL OF MEDICINE & SCIENCE IN SPORTS, 25, 20–38.

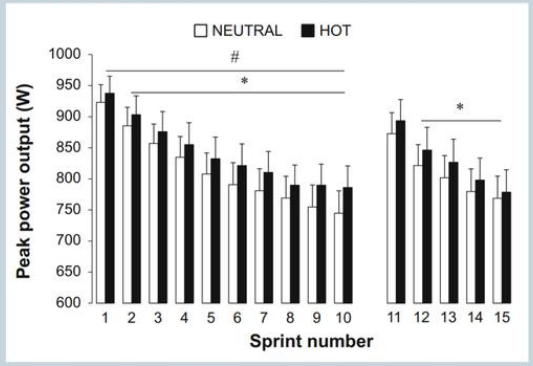
INSTAGRAM

YMPÄRISTÖN LÄMPÖTILALLA ON MERKITTÄVÄ VAIKUTUS SUORITUSKYKYYN

Teho- ja voimantuotto-ominaisuudet hyötyvät usein lämpimästä ympäristöstä. Huolellinen lämmittely ja sopiva pukeutuminen tukevat suorituskykyä.

EP2 FINLAND

ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM



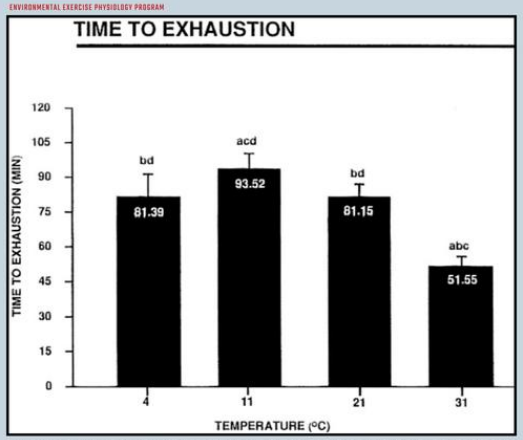
GIRARD, O., BROCHERIE, F. & BISHOP, D. J. 2015, SPRINTING IN HOT AMBIENT TEMPERATURE. SCANDINAVIAN JOURNAL MEDICINE AND SCIENCE IN SPORTS. 25, 79-89.

YMPÄRISTÖN LÄMPÖTILALLA ON MERKITTÄVÄ VAIKUTUS SUORITUSKYKYYN

Kestävyyssuorituskyky on usein parhaimmillaan viileässä ympäristössä, missä kehon lämpötilan nousu pysyy maltillisena. Sopiva pukeutuminen tukee hyvää suorituskykyä.

EP2 FINLAND

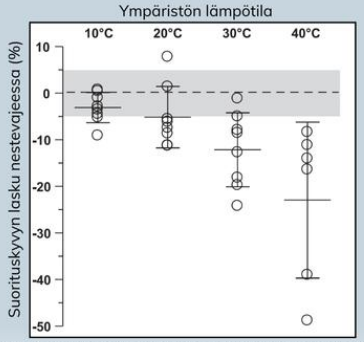
ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM



GALLOWAY, S. & MAUGHAN, R. 1997. EFFECTS OF AMBIENT TEMPERATURE ON THE CAPACITY TO PERFORM PROLONGED CYCLE EXERCISE IN MAN. MEDICINE & SCIENCE IN SPORTS & EXERCISE 29(9),1240-1249.

NESTEVAJE HEIKENTÄÄ AEROBISTA SUORITUSKYKYÄ

Nestevajeen vaikutukset aerobiseen suorituskykyyn ilmenevät erityisesti kuumissa olosuhteissa.



KENEFICK, R. W., CHEUVRONT, S. N., PALOMBO, L. J., ELY, B. R., & SAWKA, M. N. (2010). SKIN TEMPERATURE MODIFIES THE IMPACT OF HYPOHYDRATION ON AEROBIC PERFORMANCE. JOURNAL OF APPLIED PHYSIOLOGY, 109(1), 79-86.

EP2 FINLAND

ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM

EP2 FINLAND

ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM

UUSI ARTIKKELIMME MIESTEN JA NAISTEN VÄLISISTÄ EROISTA KUUMASSA ON JULKAISTU!

COACHES' GUIDE

TO TRAINING AND COMPETING IN THE HEAT

Improvements are also observed in time trial performance, where athletes must complete a fixed distance as fast as possible, closely reflecting real life competition scenarios. In such events, performance is not only limited by physiological capacity but also by pacing strategies influenced by perceived effort and thermal comfort. Heat-acclimated athletes typically show lower ratings of perceived exertion (RPE) at a given pace, allowing them to sustain higher intensities and adopt more aggressive pacing strategies without excessive thermal strain. Additionally, a modest increase in VO_2max following acclimation may further support improved endurance capacity in the heat.

Together, these adaptations allow endurance athletes to better tolerate heat, delay fatigue, and maintain higher power outputs or speeds in competition. For sports such as running, cycling, and triathlon, the performance gains from heat acclimation can translate into decisive advantages in hot and humid race environments.

Strength and Power Sports

Unlike endurance activities, heat acclimation likely does not directly enhance maximal strength, power output, or strength endurance. In fact, performance in strength and power sports is often best supported by moderate increase in ambient temperature. However, this doesn't mean heat acclimation cannot have a role in these disciplines. When even minor differences in performance can determine outcomes, the indirect benefits of heat acclimation may still offer meaningful advantages.

One of the key advantages is improvements in thermal comfort and cognitive ability positively influencing focus, reaction time, and decision making in hot environments – essential in many high-intensity sports such as weightlifting, throwing events, combat sports, or short-duration track and field disciplines. Heat-acclimated athletes may experience less mental fatigue and discomfort, enabling them to maintain technical precision and decision-making capacity even when the pressure of the heat is high.

Team and Intermittent Sports

In team and intermittent sports — such as football, basketball, rugby, or tennis — athletes perform repeated bouts of high-intensity effort interspersed with periods of low-intensity movement or rest. In these sports, thermoregulatory strain and perceptual fatigue play a critical role in performance during prolonged play in the heat. After heat acclimation, greater work and power output have been observed during repeated maximal efforts at the same level of core temperature elevation, indicating improved capacity to perform under thermal stress.

Interestingly, this enhancement in performance does not always stem from changes in physiological thermal state alone. It has been suggested that improved thermal perception (how hot and uncomfortable an athlete feels) may be equally important. Heat-acclimated athletes often report lower discomfort and exertion at a given core temperature, allowing them to push harder and maintain higher intensities without being limited by perceived heat stress. This perceptual advantage can be crucial in sustaining explosive efforts and decision-making during competitions and matches in hot environments.

Heat Acclimation Strategies

To gain the performance and safety benefits of heat acclimation, athletes should follow a structured and intentional exposure plan. The goal of a heat acclimation strategies is to produce a sufficient and reliable thermal impulse that drives the body's adaptive responses without overly compromising training quality. These strategies can vary in intensity and duration, but they all aim to progressively improve thermoregulation, cardiovascular stability, and physical performance in the heat. Understanding how to design and apply different acclimation approaches – whether active or passive, short- or long-term – is key to effective preparation for hot-weather training and competition.

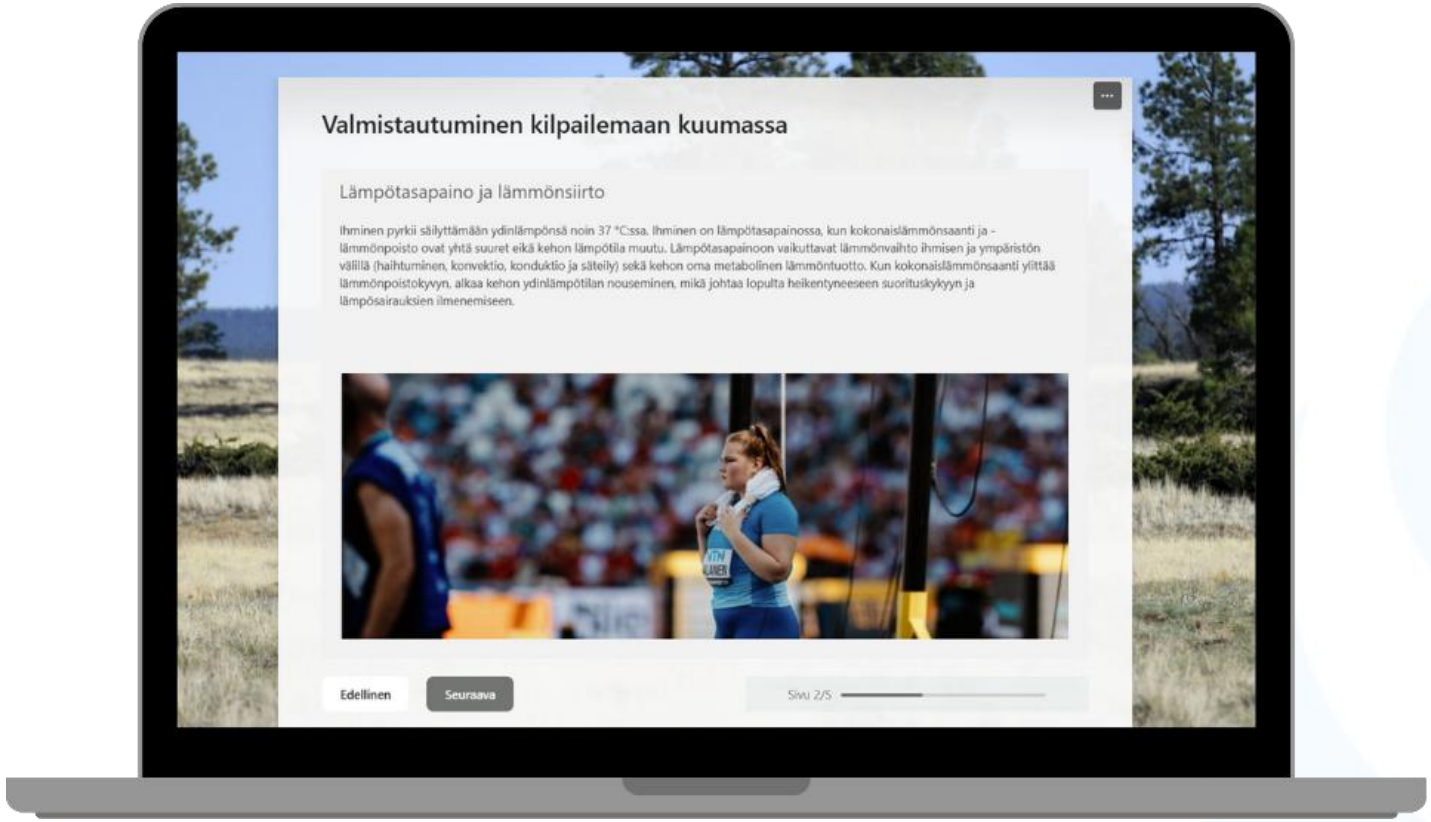
How Long to Acclimate?

Heat acclimation begins rapidly upon exposure and significant benefits are acquired during the first week of the acclimation period, including a lower heart rate during submaximal exercise and a lowered core temperature. Individuals wanting to maximize the available benefits should still aim for approximately 10 to 14 days of daily exposure as some physiological adaptations, such as improved sweat rate, require a longer time to develop. If necessary, the acclimation period can be interrupted by days of no-exposure, but this in turn slows down the acclimation process requiring a longer acclimation period if more than 1-3 heat exposures are missed.

Active and Passive Strategies

Heat acclimation strategies can be divided into active and passive methods – essentially, whether heat exposure is performed with or without exercise. For athletes, active methods may be a more effective approach for improving performance-related outcomes as the combination of metabolic heat from physical activity and the thermal load from the environment give a strong stimulus to drive adaptations. Exercise-based acclimation is typically performed in environments of 30–40 °C, but it is advisable to start from the lower end of this range with low to moderate-intensity exercise when the body is still unadapted. At this early stage, both the risk of heat illness and the performance limitations are at their highest, so a gradual progression in thermal load is advisable. As adaptation develops, increasing the environmental temperature and/or exercise intensity helps to maintain an adequate stimulus: what was effective in the beginning may no longer be sufficient to drive further physiological gains.

Online courses



AES

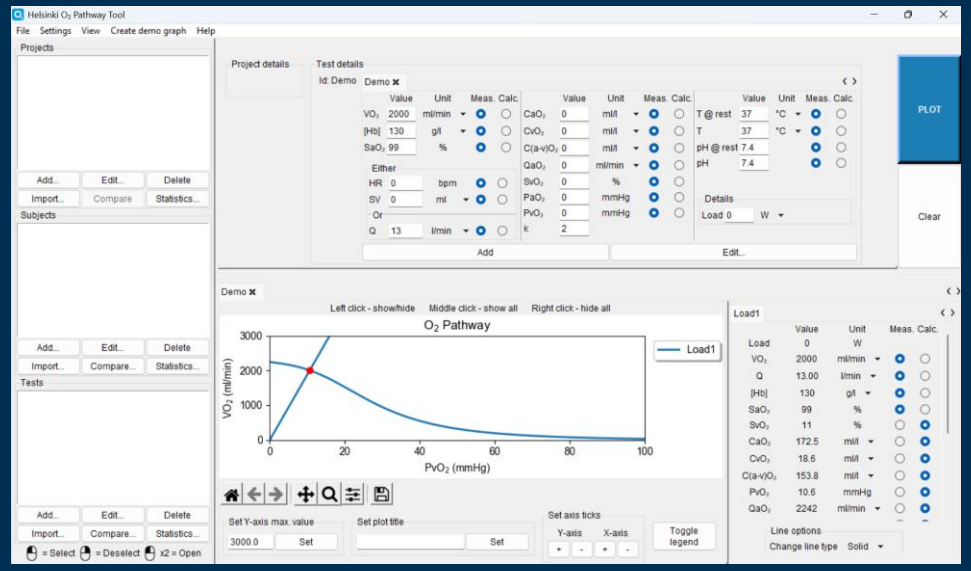
ATHLETE ENVIRONMENTAL SCORE

How are athletes acclimated to their environment?

HO2PT

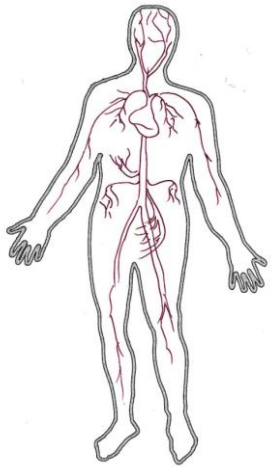
Helsinki O2 Pathway Tool

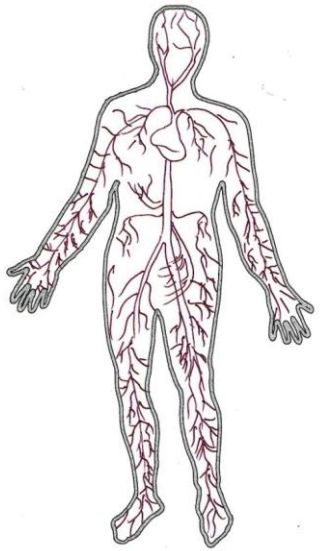
How is the environment changing oxygen transport during exercise?



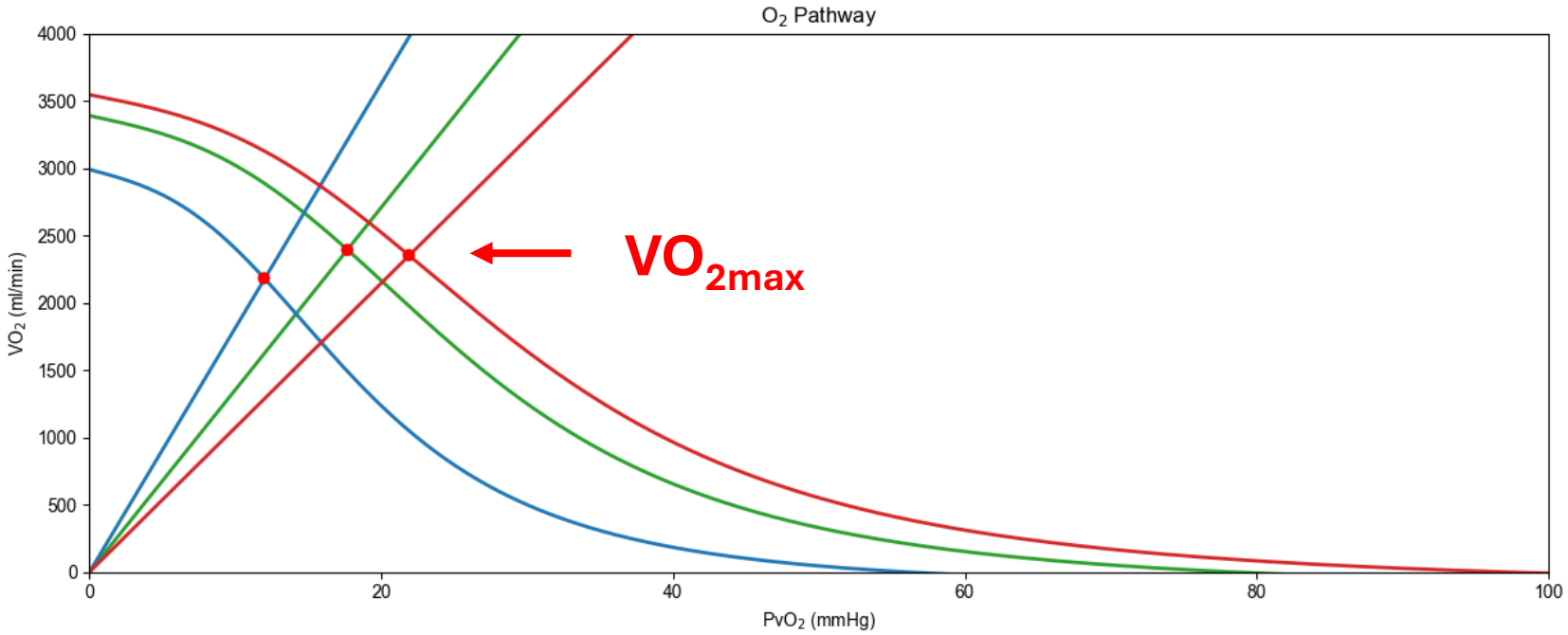
RESEARCH

- How heat stress effects physical performance?
- How heat acclimation in differs for women?
- How heat regulates muscle metabolism?
- How heat supports physical recovery?





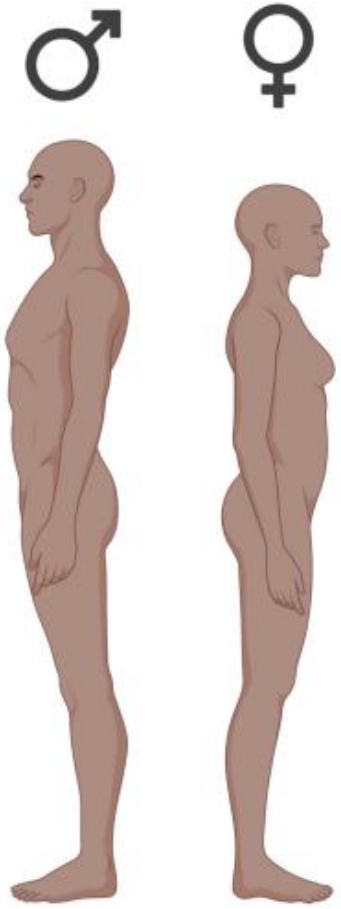
How heat stress effects physical performance?



How heat acclimation in differs for women?

↑ Body mass = ↑ heat storage capacity

↑ Absolute workload & ↑ absolute VO_{2max} = ↑ metabolic heat load

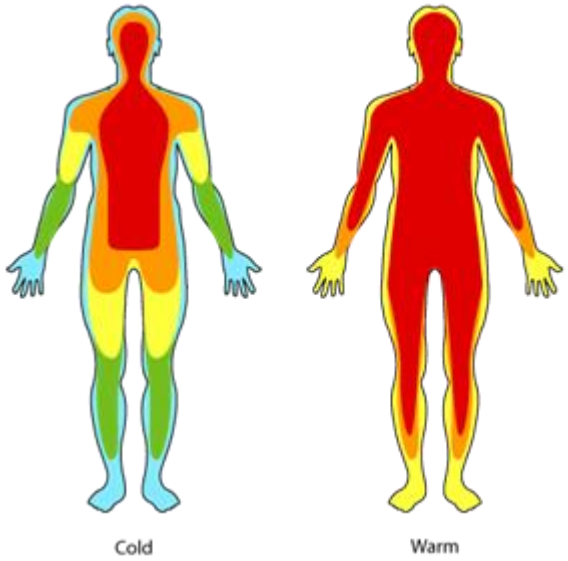


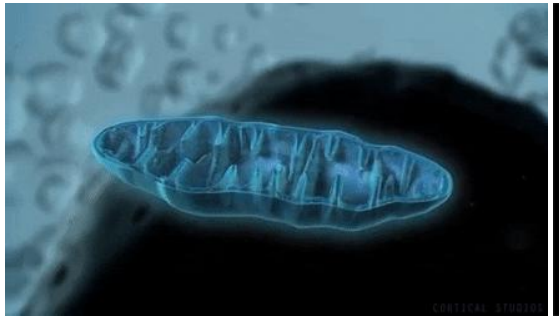
Body composition differences = ↓ heat storage capacity

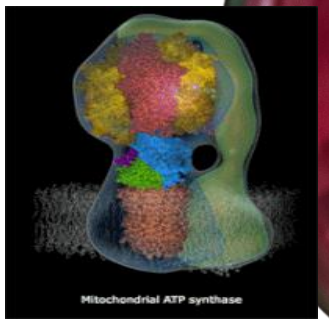
ΔT_{core} over menstrual cycle alters HA interpretation

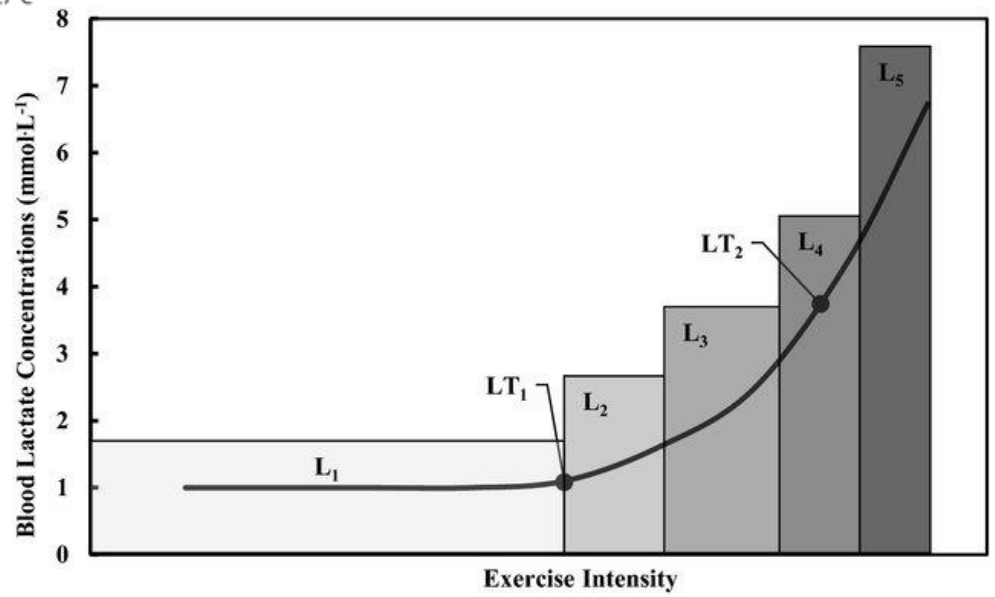
↑ Surface area:volume = ↑ "dry" heat loss capacity

WICKHAM ET AL. 2020



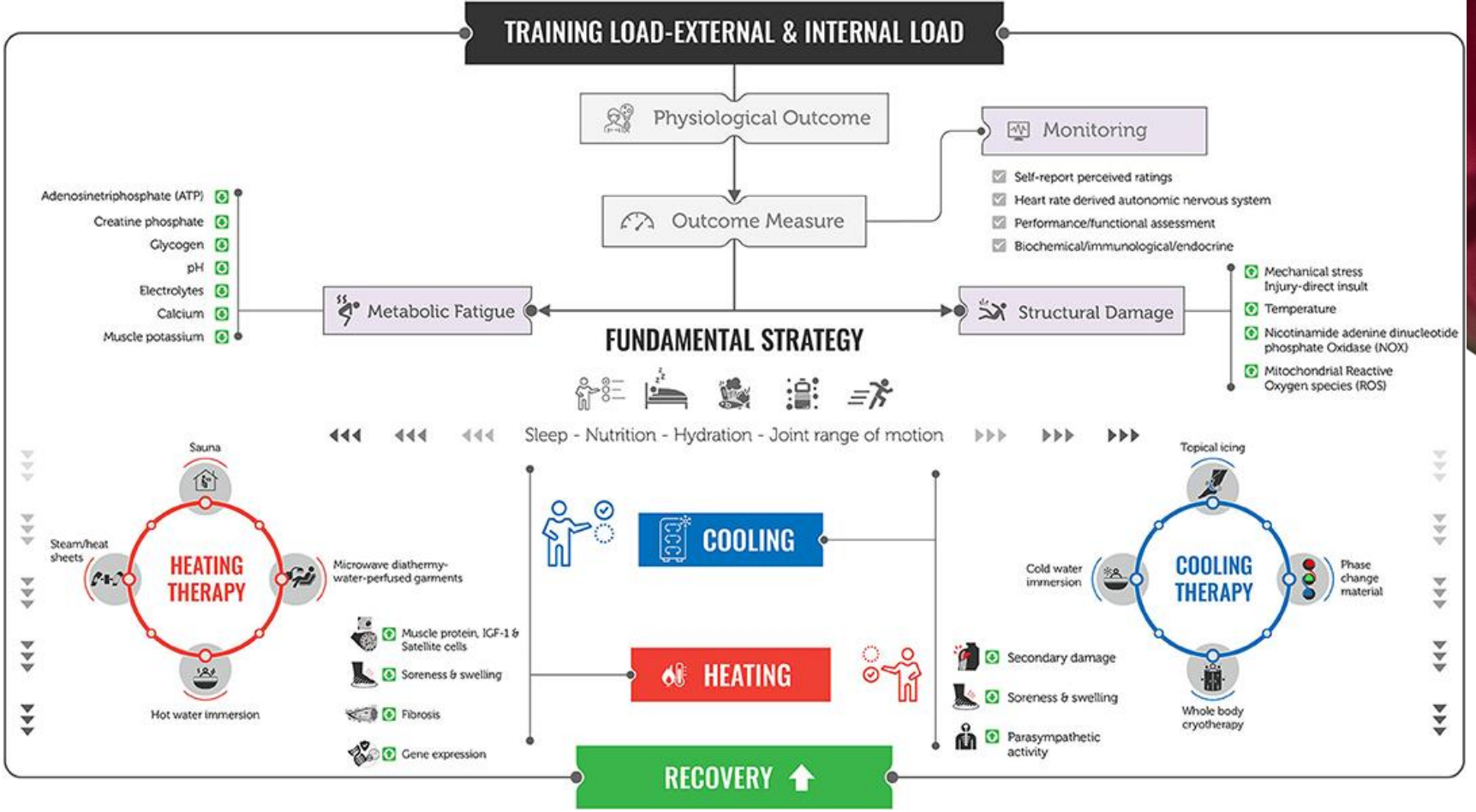






How heat regulates muscle metabolism?

JAMNICK ET AL. 2020

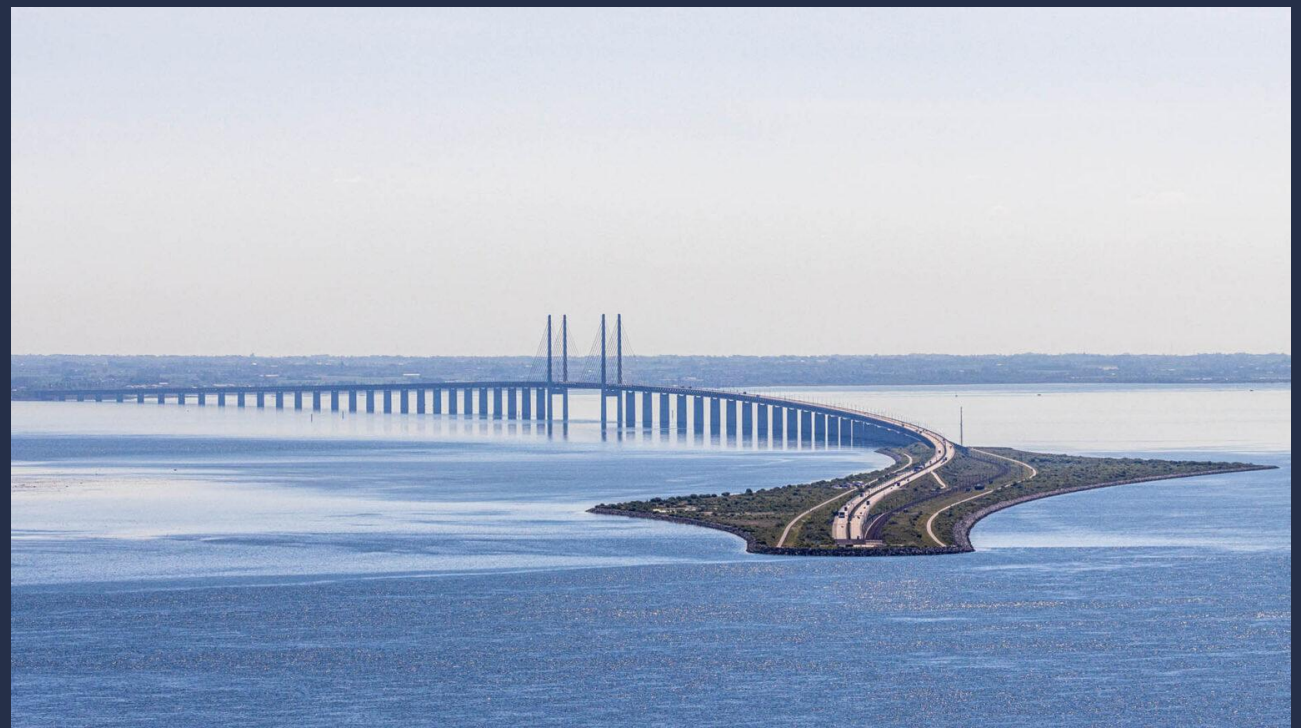


How heat supports physical recovery?

THORPE 2021

KIHU

Bridging science and sport



Finnish Institute of High Performance Sport KIHU

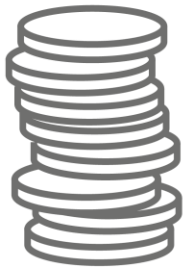
KIHU

ACTIVITIES STARTED

1991

NONPROFIT FOUNDATION

LOCATED IN JYVÄSKYLÄ

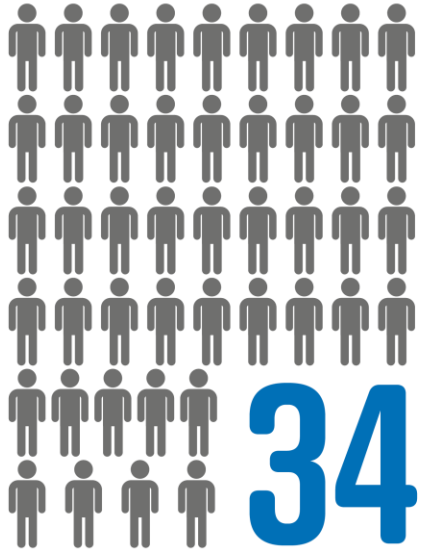


2,8

MILLION EUROS ANNUAL BUDGET

~65% FROM MINISTRY OF EDUCATION AND CULTURE

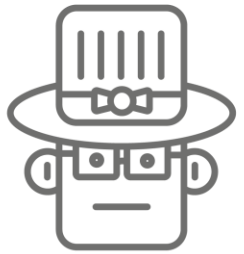
~35% OTHER ORGANIZATIONS



34

EMPLOYEES

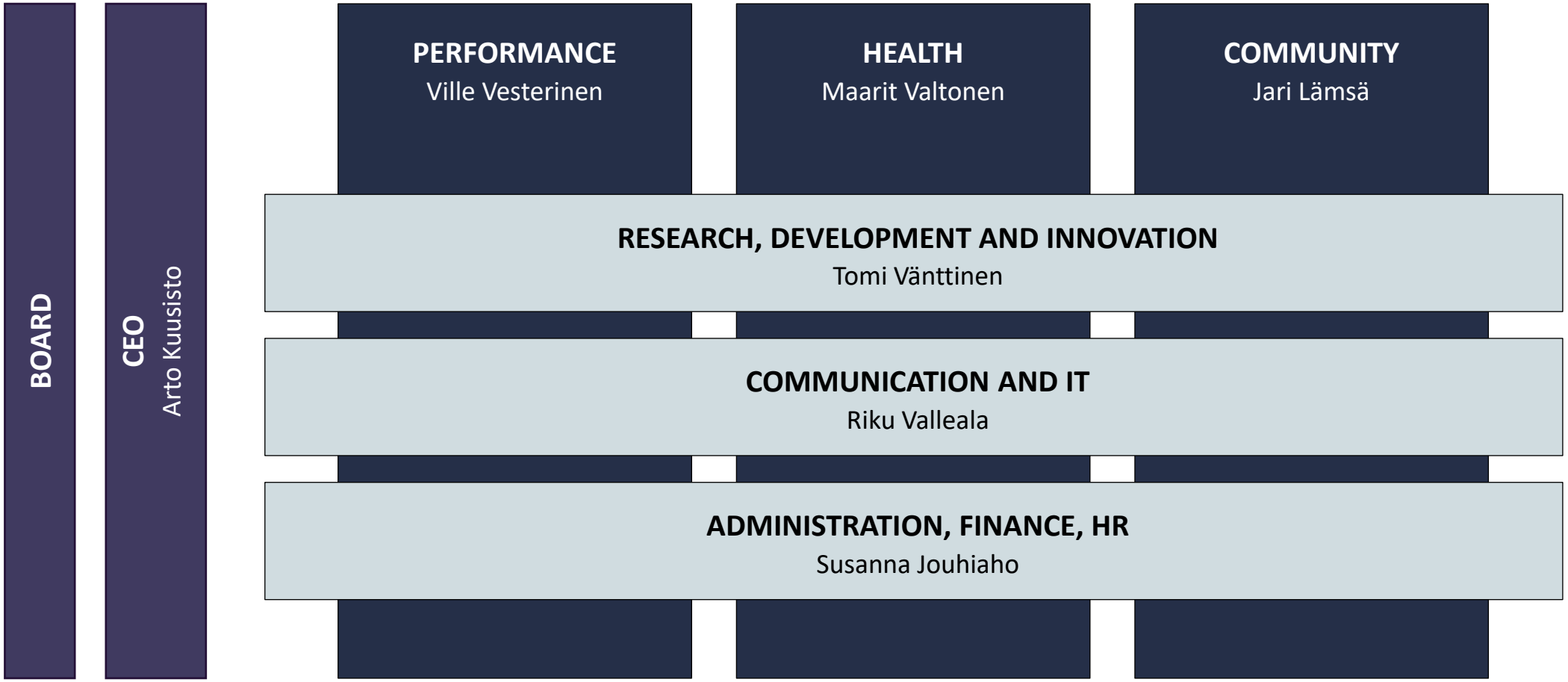
HIGHLY EDUCATED STAFF



33%

DOCTORAL DEGREE

Organization



Interdisciplinary support for athletes and coaches

KIHU

PERFORMANCE SUPPORT - SPORTS MEDICINE SUPPORT

SPORT BIOMECHANICS
- Technique analysis
- Motion analysis
- Biomechanical performance analysis (speed, strength)

PERFORMANCE ANALYTICS
- Match analysis
- Technical, tactical analysis
- Team, opponent and player analysis
- Skill / observation analysis

SPORT PHYSIOLOGY
- Performance testing and monitoring
- Monitoring of training, stress and recovery
- Preparation for special environments (high altitude, heat, cold)

SPORT MEDICINE
- Yearly pre-participation physical examination
- Individual medical support for athletes
- Medical support for coaching
- Return to sport policy/protocol
- Infectious disease prevention policy
- Medical equipment/supplies policy

STRENGTH AND CONDITIONING
- Evidence based support for coaching and development
- Analysis of physical demands

SPORT PSYCHOLOGY
- Yearly mental health screen
- Sports psychology coaching
- Psycholocical support for coaching staff

SPORT PHYSIOTHERAPY
- Support for injury preventation
- Interdisciplinary support for rehabilitation
- Support for coaching process

Sports supported by KIHU

Summer sports

- Rifle shooting, skeet&trap
- Javelin throw
- Race-walking
- Volleyball
- Hammer throw
- Swimming
- Wrestling
- Para athletics
- Sailing
- Gymnastics

Winter sports

- Biathlon
- Icehockey
- Cross-country skiing
- Nordic combined

Support for the top individuals

Multi-sport support

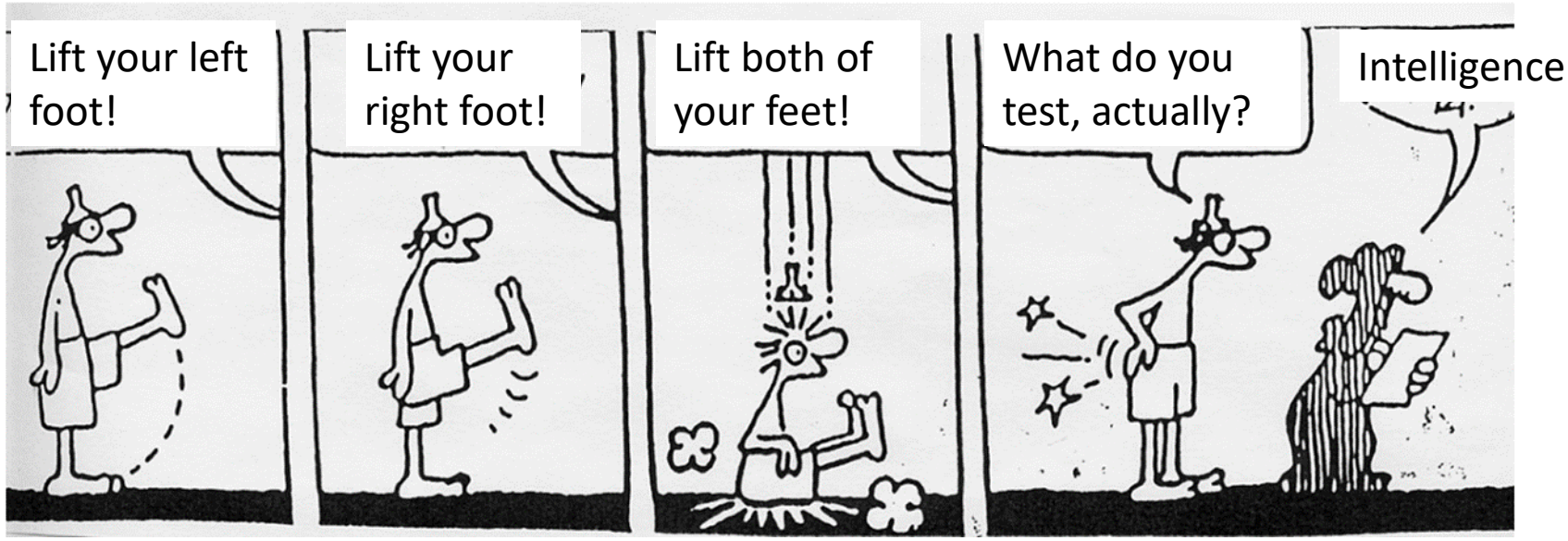
- Multi-sport support (Olympic Team preparation)
- Support for national expert networks and expert activities of sports academies/coaching centers

KIHU

Scientific support

KIHU

- Stay updated about scientific literature, but ”talk sport”
- Significant in statistics – how about in real world?



http://www.hagarthehorrible.net

Environmental stress in previous Olympic Games

- Hot and humid, 6-hour time difference
- Pre-camp (acclimatization) period of approx. 2 weeks
  - Depending on sport (discipline)
  - Partly done in advance (it was a hot summer in Finland in 2021)
  - Pre- and per-cooling, if necessary

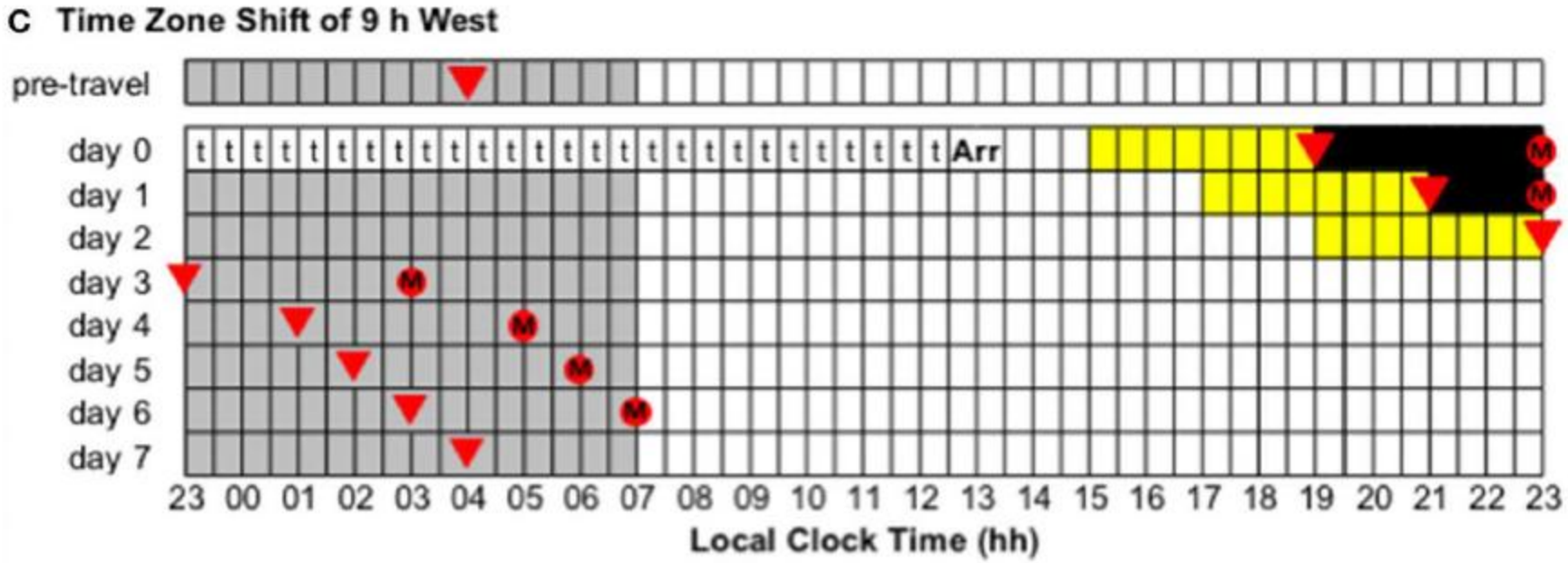
- Cold, dry, altitude, 6-hour time difference
- Altitude acclimatization
  - Training and competing at altitude for > 60 days/year
  - Pre-camp 10-14 days before games (altitude and time zone)
- Cold
  - Protection, warm-up procedures
  - Ski preparations

Pic: Teemu Lemmettylä

KIHU

What to expect in LA 2028

- Time zone UTC -7 => 10-hour difference to Helsinki (UTC +3)



Roach & Sargent 2019,
doi: 10.3389/fphys.2019.00927

What to expect in LA 2028

KIHU

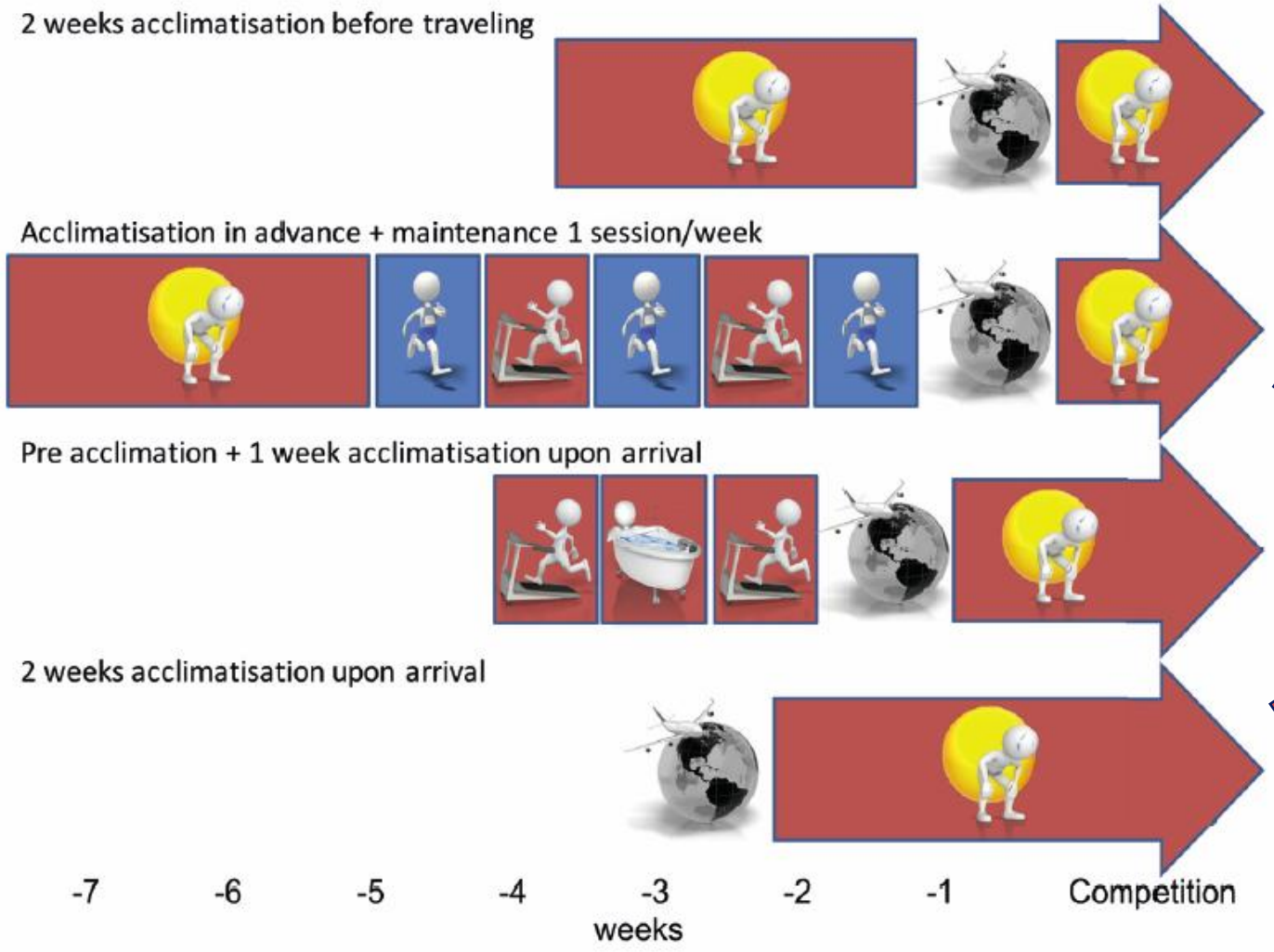
Table 1
Temperature and relative humidity from a coastal (Los Angeles International Airport) and inland (San Gabriel Valley Airport) weather stations proximal to expected event locations for the 2028 Los Angeles Olympic and Paralympic Games.

	Olympic Games (14–30 July)		Paralympic Games (22 Aug–3 Sep)	
	Coastal station	Inland station	Coastal station	Inland station
Temperature data (2019–2023)				
Daily average (°C)	20.0 ± 1.4 (17.1–23.8)	27.3 ± 2.5 (19.9–32.2)	21.5 ± 1.9 (18.1–26.4)	27.5 ± 3.3 (19.6–36.1)
Daily maximum (°C)	23.3 ± 1.8 (20.0–28.9)	32.0 ± 2.6 (26.1–37.8)	25.1 ± 2.8 (20.6–32.8)	32.1 ± 3.5 (22.8–40.0)
Days > 30 °C (%)	0	82	8	71
Days > 35 °C (%)	0	16	0	23
Relative humidity data (2019–2023)				
Daily average (%)	79.1 ± 4.2 (64.9–86.6)	49.3 ± 8.0 (29.7–64.8)	76.0 ± 6.0 (30.2–88.1)	50.3 ± 10.5 (26.9–83.1)
Daily maximum (%)	90.7 ± 4.4 (79.0–100)	76.6 ± 6.6 (57.0–88.0)	88.8 ± 5.5 (76.0–100)	77.5 ± 10.6 (48.0–100)

NB. Data are mean ± standard deviation (minimum–maximum) of available daily data from the same dates as for the 2028 Los Angeles Games.

Bongers et al 2024, https://doi.org/10.1016/j.jsams.2024.07.015

Acclimatization to LA 2028



Combining these to fulfill our needs

Note: Team Finland will have Pre-Olympic camp close to LA (10-14 days)

Racinais et al 2019

Hydration

- Fluid-balance / morning urine color or special gravity
- Weight measurements
  - Before, during after training session
  - Correcting fluid losses by 150 % in the following hours

https://adultpediatricuro.com/meaning-behind-color-of-your-urine/

Cooling – if necessary

- Pre-cooling
  - Cold water immersion?
  - Cooling vest?
- Per-cooling
  - Cooling vest/neck wrap
  - Cold & wet towel?
  - Cold drinks
  - Ice (handheld / headwear)

- Different sports – different needs, e.g.
  - Marathon running
  - Pole vault
  - Wrestling

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Conclusion

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- Most important thing is to be in good shape, but otherwise:
  - Know what to expect
  - Know how to prepare yourself (for the worst scenario)
  - Plan individually the details
  - Repeat the details in advance
  - Enjoy competing

- When you know what to do, you can relax like The Iceman:

  ”*Leave me alone, I know what to do*”

  (Kimi Räikkönen in team radio during F1 race, Abu Dhabi, November 2012)

EP2 FINLAND

ENVIRONMENTAL EXERCISE PHYSIOLOGY PROGRAM

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