21-24 March: Modern Coach - A seminar for young coaches

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

JYU Sports Technology Unit

Science Meets Coaching

Ritva Mikkonen, PhD

Sports Technology Unit, Vuokatti

Faculty of Sport and Health Sciences

University of Jyväskylä

JYU Sports Technology Unit

Science Meets Coaching

Contents

* About me
* What is Sports Technology?
* JYU Sports Technology Unit in numbers
* Research and learning environments
* Degree programs
* Highlights of current projects

Ritva Mikkonen (Taipale), PhD

Project manager and researcher

University of Jyväskylä, Sports Technology Unit, Vuokatti

2003-2007

Bachelor of Arts
Health Fitness *(ACSM)*

GUSTAVUS ADOLPHUS COLLEGE

2007-2013

MSc and PhD
Science of Sport Coaching and Fitness Testing

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

2013-2015

PostDoc

KAMK · University of Applied Sciences

Senior lecturer

2015-2019

AmO

jamk | University of Applied Sciences

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

2019 →

Research!
Education projects!

- Competition and coaching experience in skiing and running

Johanna K. Ihalainen, Anthony C. Hackney, Jarmo Piirainen, Vera Salmi, Ida Löfberg, Oona Kettunen, Heikki Peltonen, Maarit Valtonen, Katja Mjösund, Kirsty Eliott-Sale, Kathryn E. Ackerman, Ida Heikura, Guro Strøm Solli, Ari Nummela, Juha Peltonen, Antti Leppävuori, Kerry McGawley, Simon Walker, Marja Kokkonen, Heikki Kyröläinen, Keijo Häkkinen & several other PhD students, **Master's and Bachelor's students ! <3**

SPORTS TECHNOLOGY UNIT
Vuokatti

Euroopan unioni
Euroopan aluekehitysrahasto
Euroopan sosiaalirahasto

Vipuvoimaa EU:lta 2014–2020

Euroopan unioni
Euroopan sosiaalirahasto

Kainuu

SOTKAMO.fi

CEMIS
Centre for Measurement and Information Systems

Sports technology

Definition

Sports technology seeks solutions to use technological knowledge for the enhancement of physical activity and health.

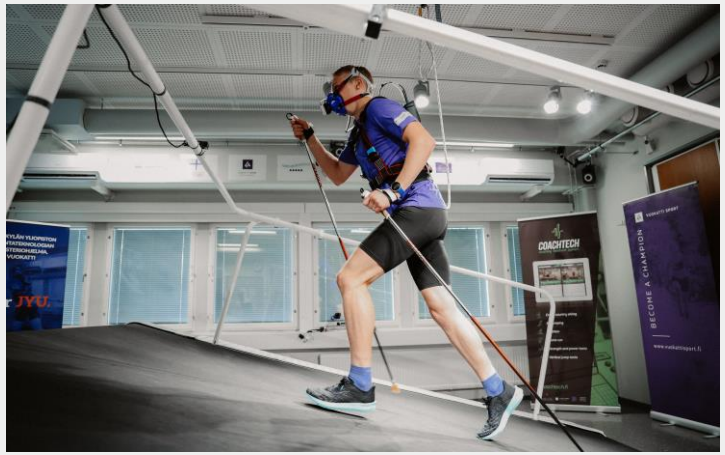
Application areas include: elite sports, health enhancing exercise and physical activity, as well as rehabilitation.

Development targets in sports technology can include analysing softwares and assistive technology.

Vuokatti Sports Technology Unit

Who are we?

- Education and Research Unit
- Founded in 2004
- **Director:**
  - Professor Vesa Linnamo
- Staff: 17 employees
- Facilites: Snowpolis
  - Set ups ”in the field”
- Budget 2022: 1,2 M€



- **University of Jyväskylä, Faculty of Sport and Health Sciences**

Research

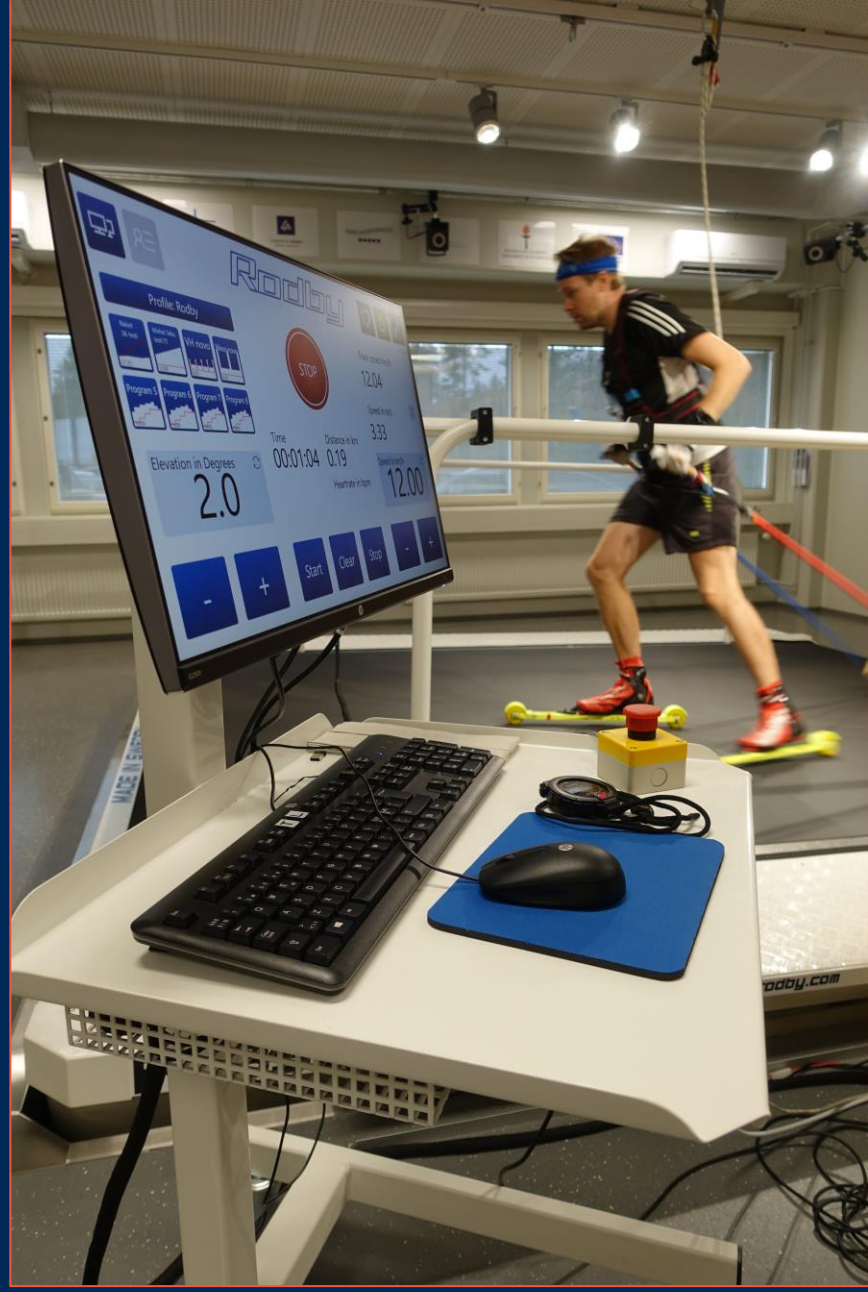
- Multidisciplinary and applied research in **biology of physical activity in three main areas:**
  - Biomechanics
  - Exercise physiology
  - Science of sport coaching and fitness testing

- Strong emphasis on applied research in **Nordic skiing sports**
  - Technology application and development
  - From science to practice

Vuokatti Sports Technology Unit in Numbers:

87	Master's of Science
6	Defended dissertations *(10 projects in progress)*
108	Peer-reviewed scientific articles
43	Books or book chapters
180	Congress abstracts
8	Hosted international conferences or seminars
81	Invited lectures *(53 international)*
124	Jobs
16	Businesses
63	Business partners
30	Organizations as partners

~14 M€ Project funding/stipends



2021 Global Ranking of Sport Science Schools and Departments (Shanghai list)

JYU's Faculty of Sport and Health Sciences

8th place

1	Deakin University School of Exercise and Nutrition Sciences Institute for Physical Activity and Nutrition		100.0	95.4
2	Norwegian School of Sport Sciences Norwegian School of Sport Sciences		91.7	72.9
3	University of Copenhagen Department of Nutrition, Exercise and Sports Institute of Sports Medicine		90.9	91.6
4	University of Verona Faculty of Exercise and Sport Sciences Department of Neurosciences, Biomedicine ...		86.1	100.0
5	Loughborough University School of Sport, Exercise and Health Sciences		76.1	93.6
6	Vrije Universiteit Amsterdam Faculty of Behavioural and Movement Scien...		72.0	96.3
7	The University of Queensland School of Human Movement and Nutrition Sc...		69.7	69.3
8	University of Jyvaskyla Faculty of Sport and Health Sciences		68.0	69.7

International co-operation

Universities:

- University of Mid Sweden
- University of Gothenburg, Sweden
- Politecnico di Torino, Italy
- Katholieke Universiteit Leuven, Belgium
- University of Salzburg, Austria
- University of Zurich, Switzerland
- Beijing Sport University, China

Networks:

- Scandinavian Network for Elite Sports
- ClusSport
- EPSI

Regional and national co-operation

VUOKATTI SPORT
OLYMPIC TRAINING CENTER

VUOKATTI - RUKA URHEILUAKATEMIA

KIHU

Kajaanin Yliopistokeskus

CEMIS
Centre for Measurement and Information Systems

VTT

X-Country Ski TEAM FINLAND

Nordic Combined TEAM FINLAND

Ski Jumping TEAM FINLAND

SUOMEN AMPUMAHIIHTOLIITTO
FINNISH BIATHLON FEDERATION

Leverage from the EU 2014–2020

European Union
European Regional Development Fund

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Kainuu

Ministry of Education and Culture

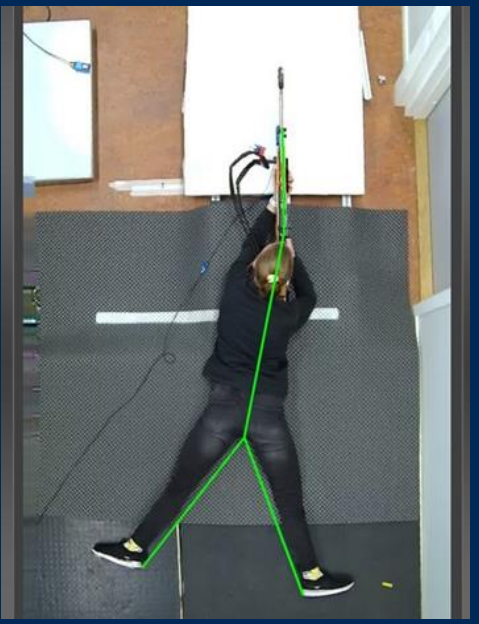
Research and testing environments in Vuokatti

Research and testing environments in Vuokatti

Ski tunnel

Ski testing labratory

Ski labratory



Shooting labratory (biathlon)

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Euroopan aluekehitysrahasto
Euroopan sosiaalirahasto
Vipuvoimaa EU:lta 2014–2020
KAINUUN LIITTO
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ
VUOKATTI SPORT
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Degree programs

Dual career program

- Degrees from the Kajaani University of Applied Sciences (BSc) and University of Jyväskylä (MSc)
- Started in 2020
- Accepting applications NOW
- Next planned application period 2024
- Duration of studies: approx. 7 years

KAMK • University of Applied Sciences

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Study rights for technology degree at KAMK

30 op KAMK

Special study rights at JYU for a limited offering of studies

BSc

Study rights at JYU

MSc

Vuokatti-Ruka Sports Academy

For more information: www.liikuntateknologia.fi, essi.fonselius@kamk.fi or ritva.s.taipale@jyu.fi

- 12 student-athletes
- >874 credits (KAMK + JYU)
- 6 sports represented
  - Nordic and alpine skiing, biathlon, ski orienteering, hockey, and baseball.

Sports Technology Master's Degree Program

Sports Technology
Vuokatti

Background studies (120 credits)

Biology of physical activity (120 credits)

- **Biomechanics**
- **Excercise Physiology**
- **Science of Sport Coaching and Fitness Testing**

- Since 2004
- Accepting applications NOW
- You must have a bachelor's degree including at least 50 credits from "technical" studies

For more information:
jarmo.m.piirainen@jyu.fi

Study language: Finnish (with English language literature)

PhD Program (since 2005)

Defended dissertations

- Physical load of the conscript, Minna Tervo, 2012
- Balance control of elderly, Jarmo Piirainen, 2014
- Arm swing in XC-skiing, Caroline Göpfert, University of Salzburg, 2017
- Technical determinants of superior rifle shooting technique, Simo Ihalainen, KIHU 2018
- Skating XC-skiing, Olli Ohtonen, 2019
- Para sit-skiing, Valeria Rosso, Politecnico di Torino, 2019

10 on-going PhD projects

PhD Program (since 2005)

Dissertations in progress:

- Physical load of young athletes, Christina Mishica
- Ski friction and ski testing , Teemu Lemmettylä
- Movement analysis in XC-skiing, Shuang Zhao
- Energy balance of female skier, Oona Kettunen*
- Frequency in cross-country classic skiing technique, Jussi Piirainen
- Practical testing methods for alpine and freeski, Jonathan McPhail
- Biathlon tests, Miika Köykkä
- Motor control of the athlete, Nijia Hu
- Endogenous androgens and endurance training in females, Vera Salmi*
- Endurance training, endogenous sex hormones, energy balance and body composition in women, Ida Löfberg*

*=Ritva is supervisor or co-supervisor

Project & RDI operations

Euroopan unioni
Euroopan aluekehitysrahasto
Euroopan sosiaalirahasto

Vipuvoimaa EU:lta 2014–2020

Elinkeino-, liikenne- ja ympäristökeskus

Kainuu

SOTKAMO.fi

BUSINESS FINLAND

CEMIS
Centre for Measurement and Information Systems

Opetus- ja kulttuuri-ministeriö

Main goals and principles

Special emphasis on developing solutions for athlete testing and sport coaching

- Monitoring of performance → *sensor integrations, instant feedback, motion analysis*
- Active dialogue with coaches → *Vuokatti Sports Academy, Olympic Training Center Vuokatti-Ruka*
- Co-operation with the Finnish sports and wellbeing technology industry
- Educating students from diverse backgrounds (engineering and marketing)

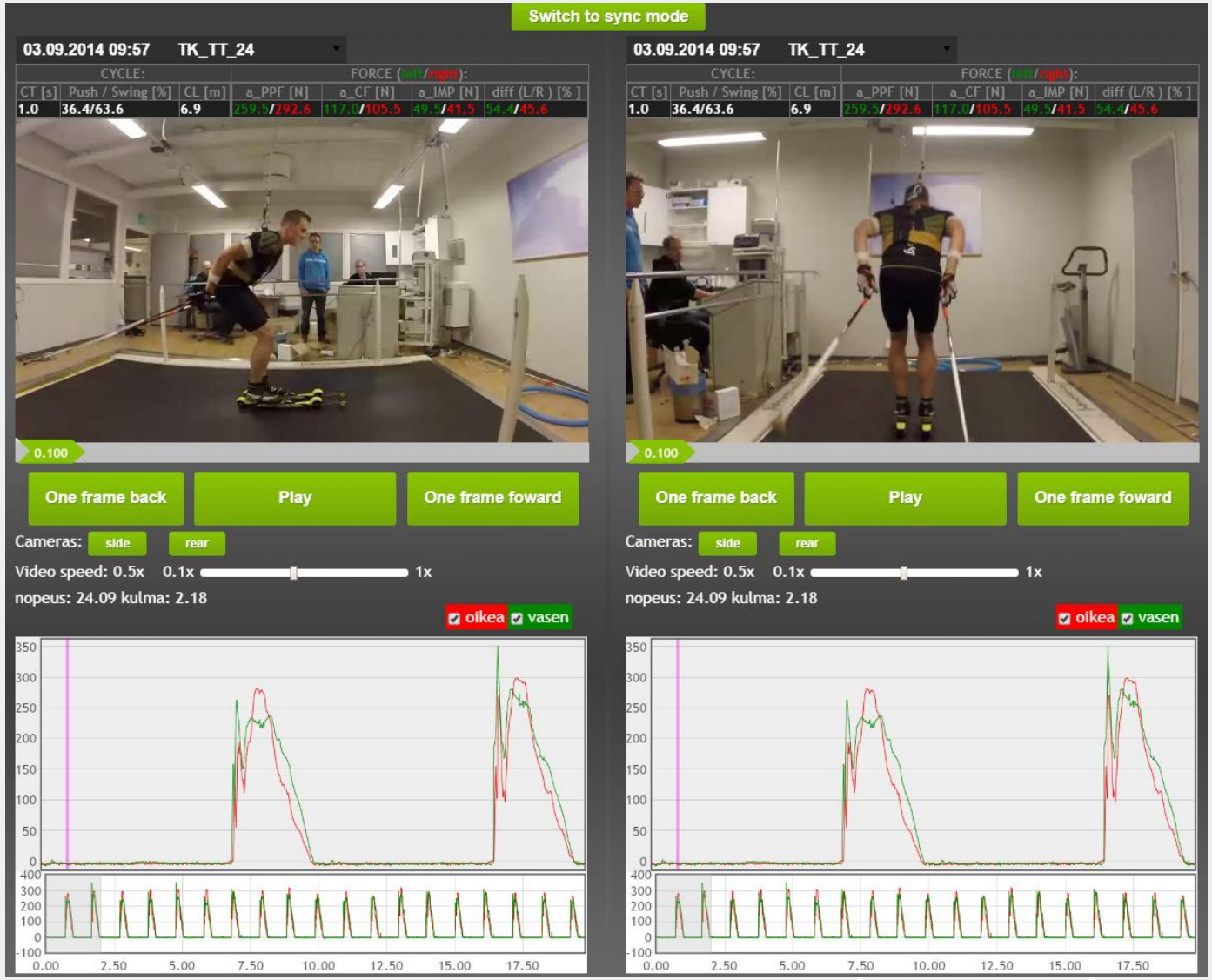
From science to practice

Coachtech

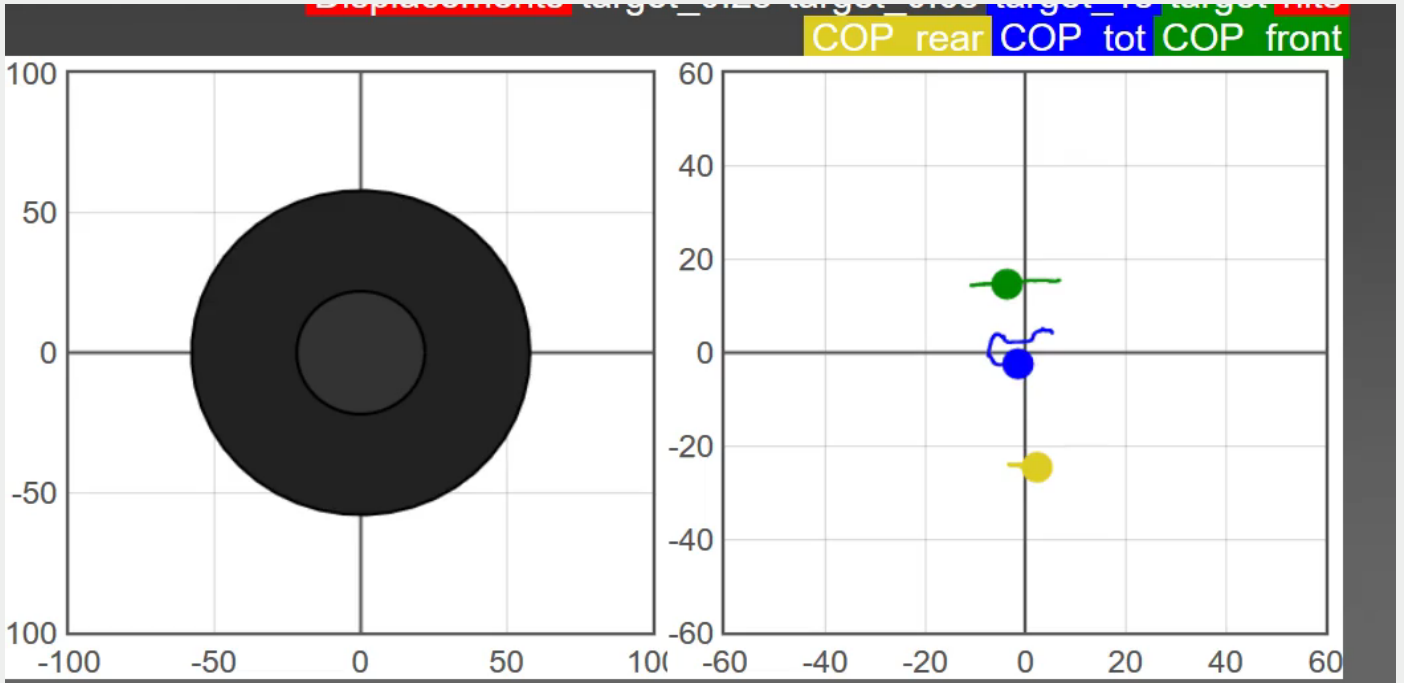
Feedback tool for coaching

- Combination of video(s) and analog signals
- **Not** sport specific
- Real time feedback
- Easy to use
- Web analysis and storage
- Information to coaches available in an easy-to-use format

- Wireless Nodes (40 x 28 x 92 mm, 58g)
- Accelerometers + force sensors
- Cameras, GoPro Hero 3 (4)
- Computer
- Potential to integrate other signals



Coachtech - shooting

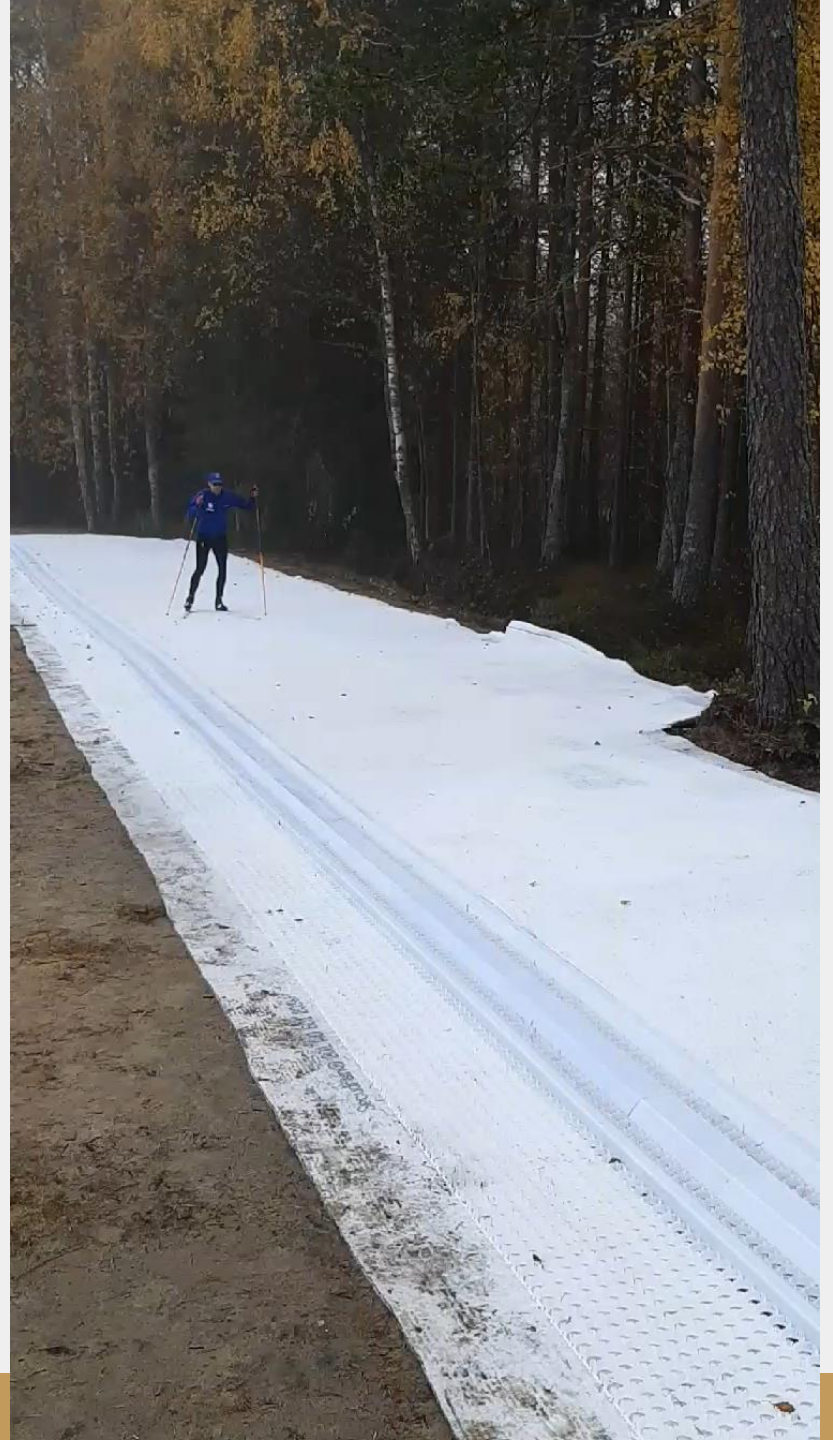


Aiming							
Points	dist	TTI	dev (x;y)	COA	COG	ATV	TaT
9	15.4	4	17.7 / 23.1	34	29.7	34	0.443

Balance							
front/rear [%]	loc_rel	dev_tot	dev_f	dev_r	rom_tot	rom_f	rom_r
58 / 42	2.4	0.4 / 0.4	0.5 / 0.0	0.4 / 0.1	1.2 / 1.7	1.3 / 0.2	1.5 / 0.3

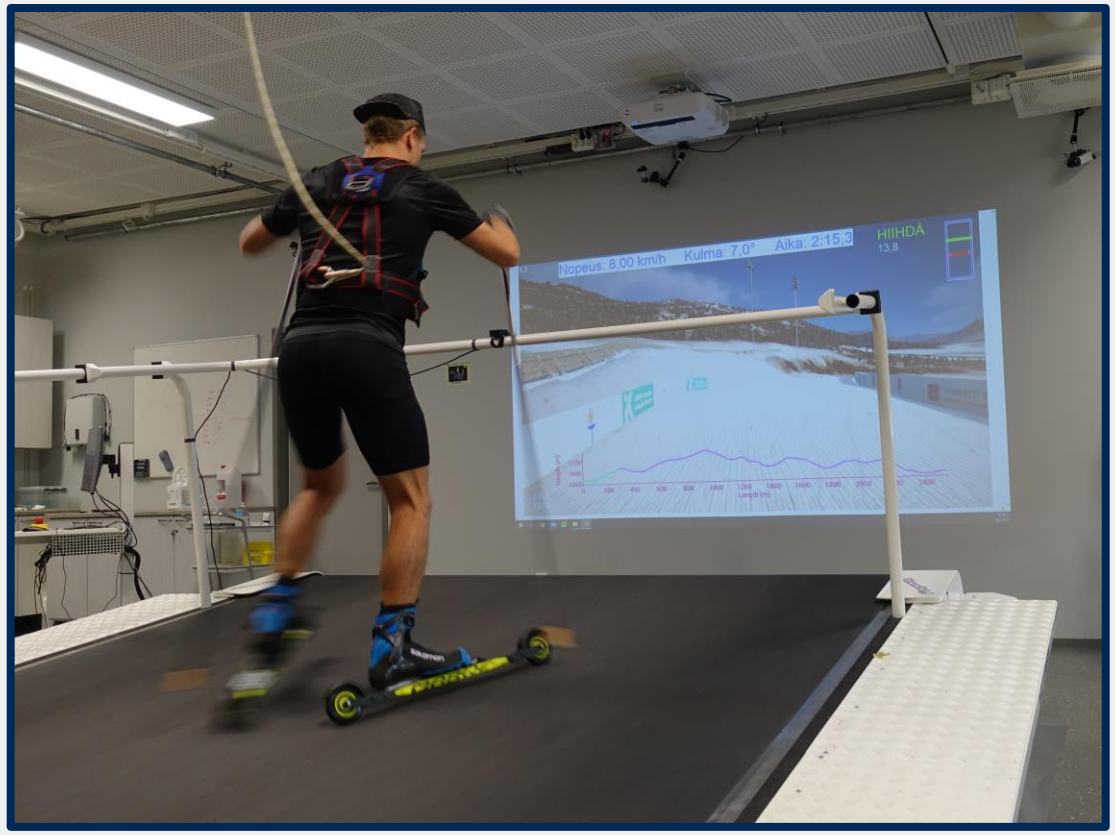
Sensor integration

”SummerSki” artificial skiing track



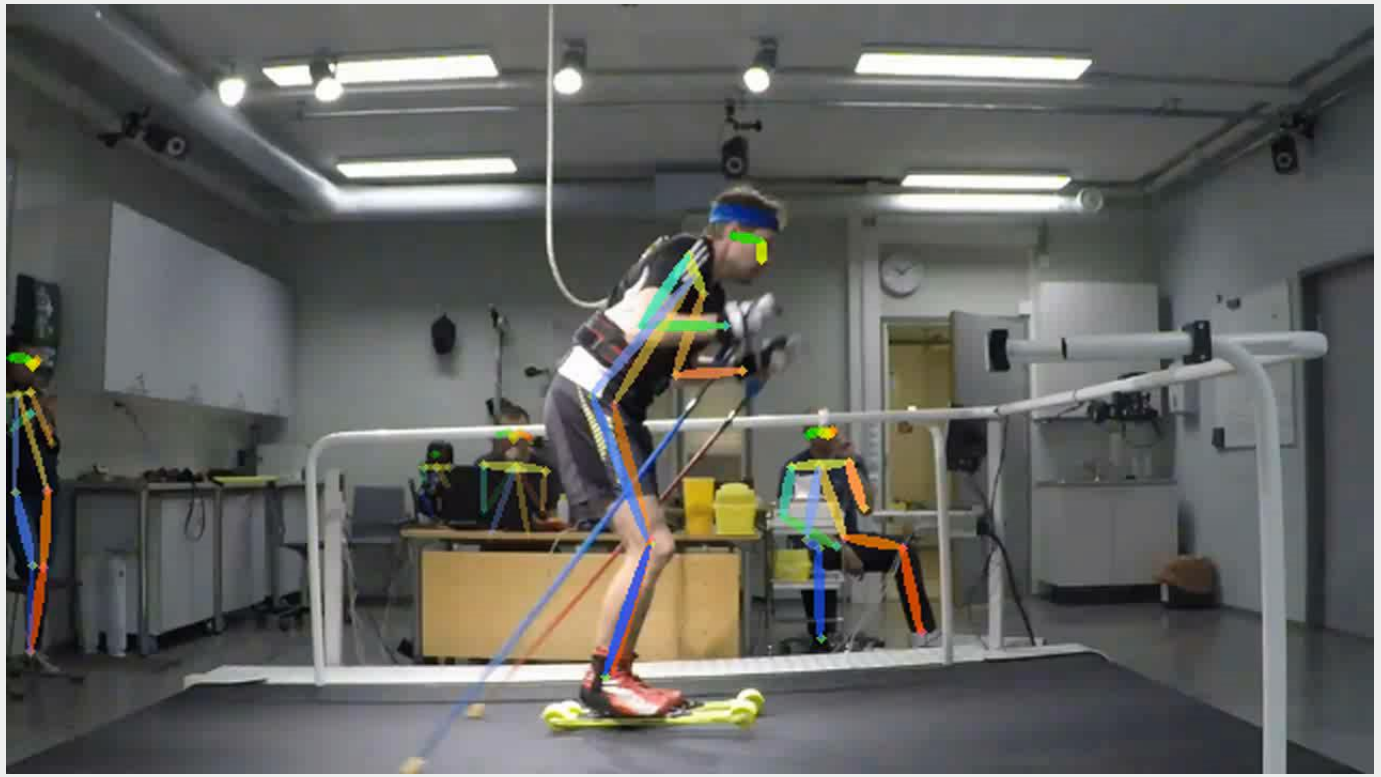
Virtual environments

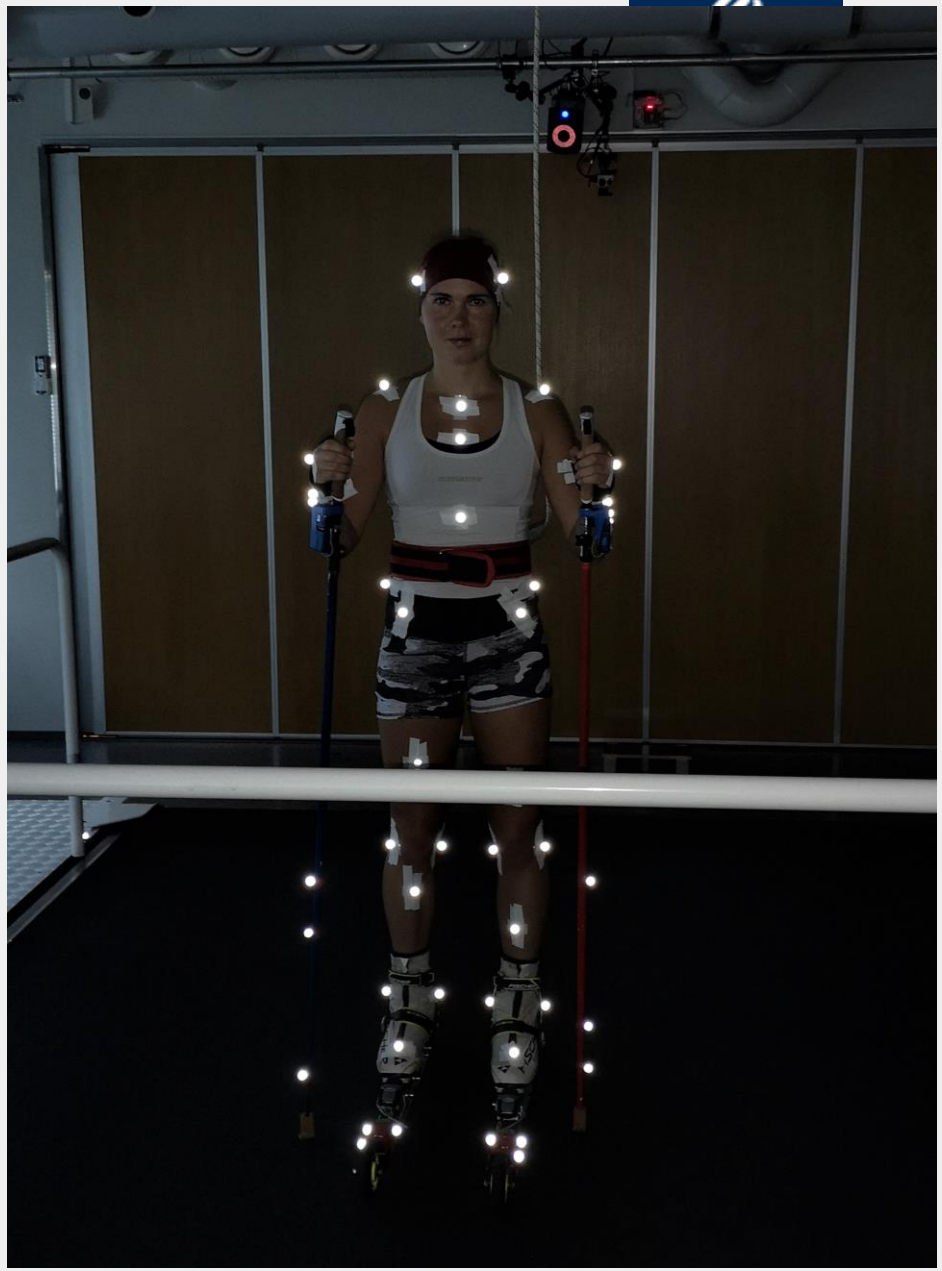
- Possible to “get to know” race-courses from “anywhere” in the world from the lab
- Changes in elevation can be simulated



Automated motion analysis

- Utilization of computer vision and pose estimation
- For automatic recognition/calculation of joint angles
- Treadmill skiing, biathlon shooting, dynamic balance

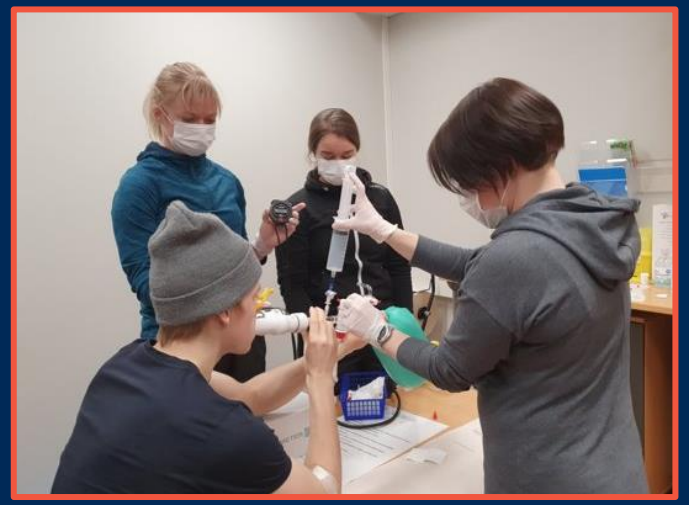




Current projects
(Ritva's highlights)

Altitude living / training

Korkean paikan harjoittelun tutkimus- ja investointihankkeet Vuokatti (KohatuVu)



Research questions

- **What kinds of individu… imitaztion responses and adaptations are observed in … ub-elite athletes?**
  - Acute … EPO) and adaptation (e.g. EPO, Hb, and Hb mass)
  - Monto…ng of duration at altitude (time), altitude (m), training (endurance and strength)

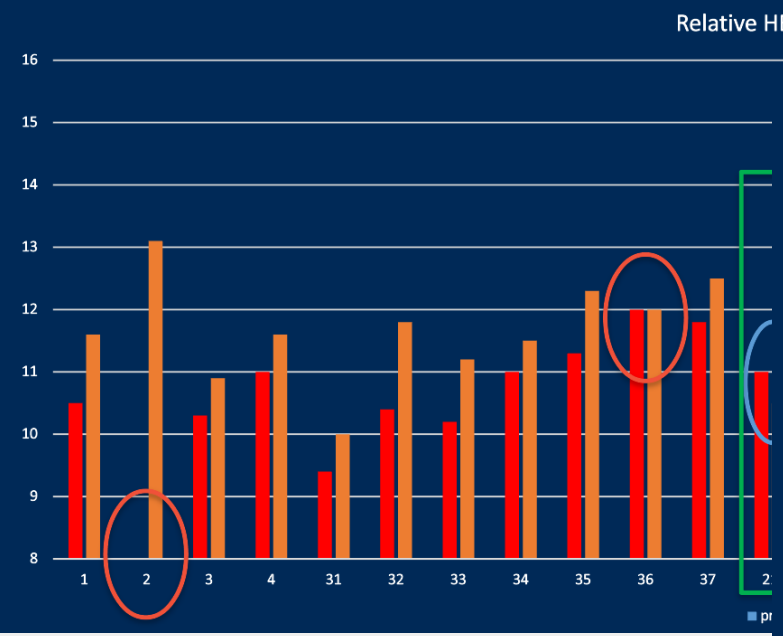
I will show you some preliminary data.

- **How can we maintain (or prolong) the hypoxia adaptation after returning to sea level?**
  - How many hypoxic training sessions or nights in an altitude house/tent may be needed?

- **Influence of … e autonomic nervous system**
  - W… …ng/recovery may help to maintain autonomic nervous system balance?

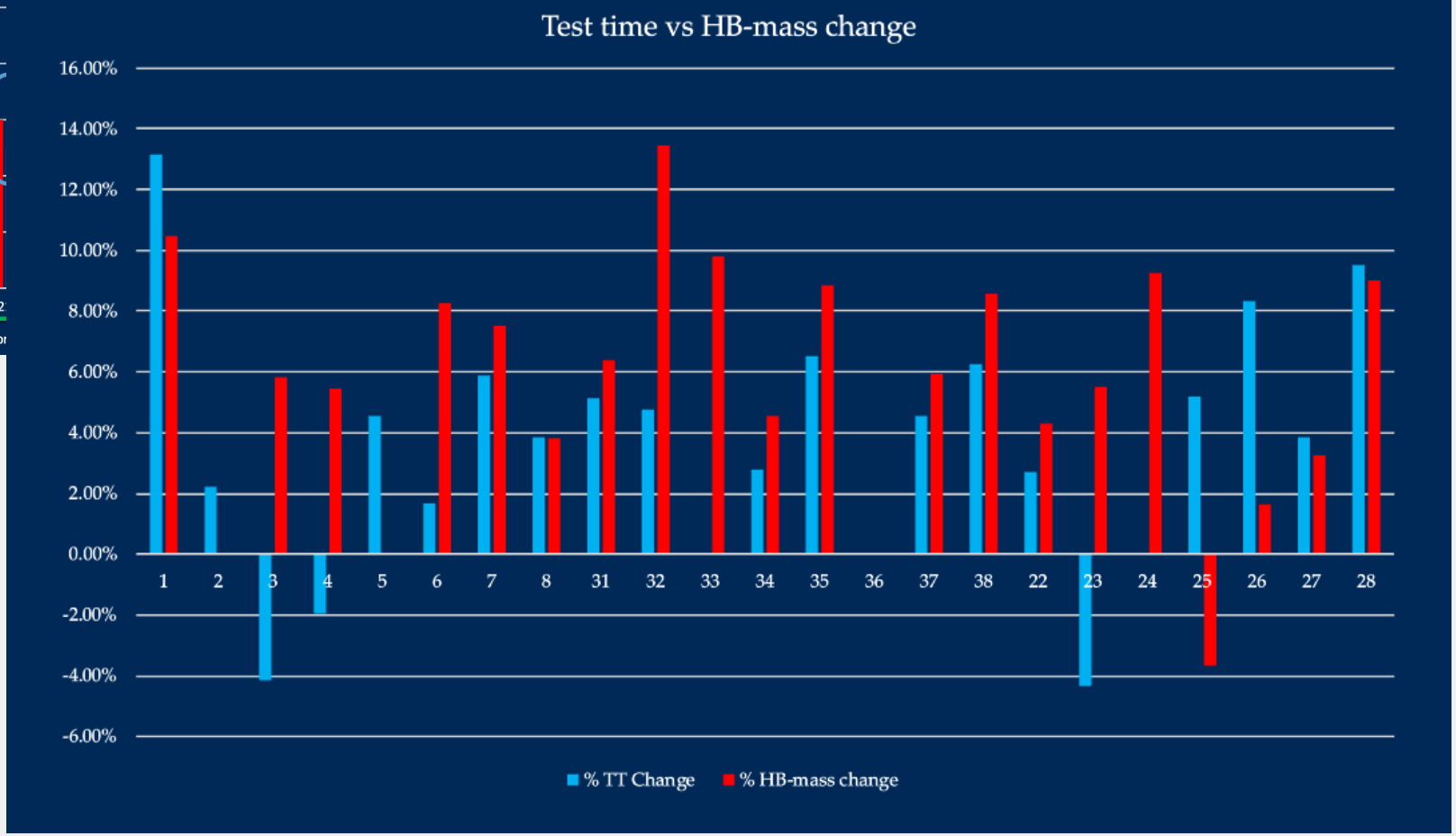
I will show you some preliminary data.

Relative HB-mass changes



Preliminary data, not for public use

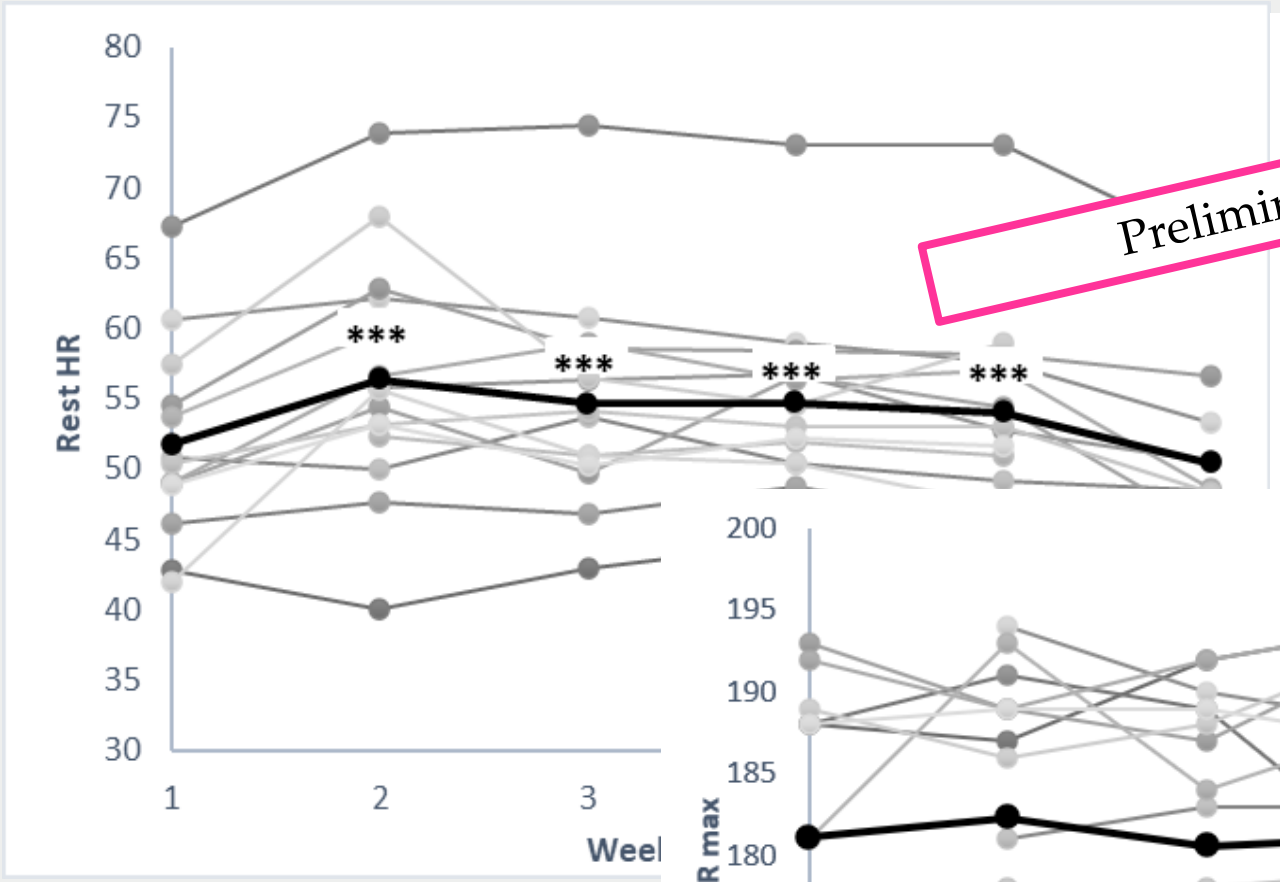
Hb-mass (g/kg) vs performance (t)

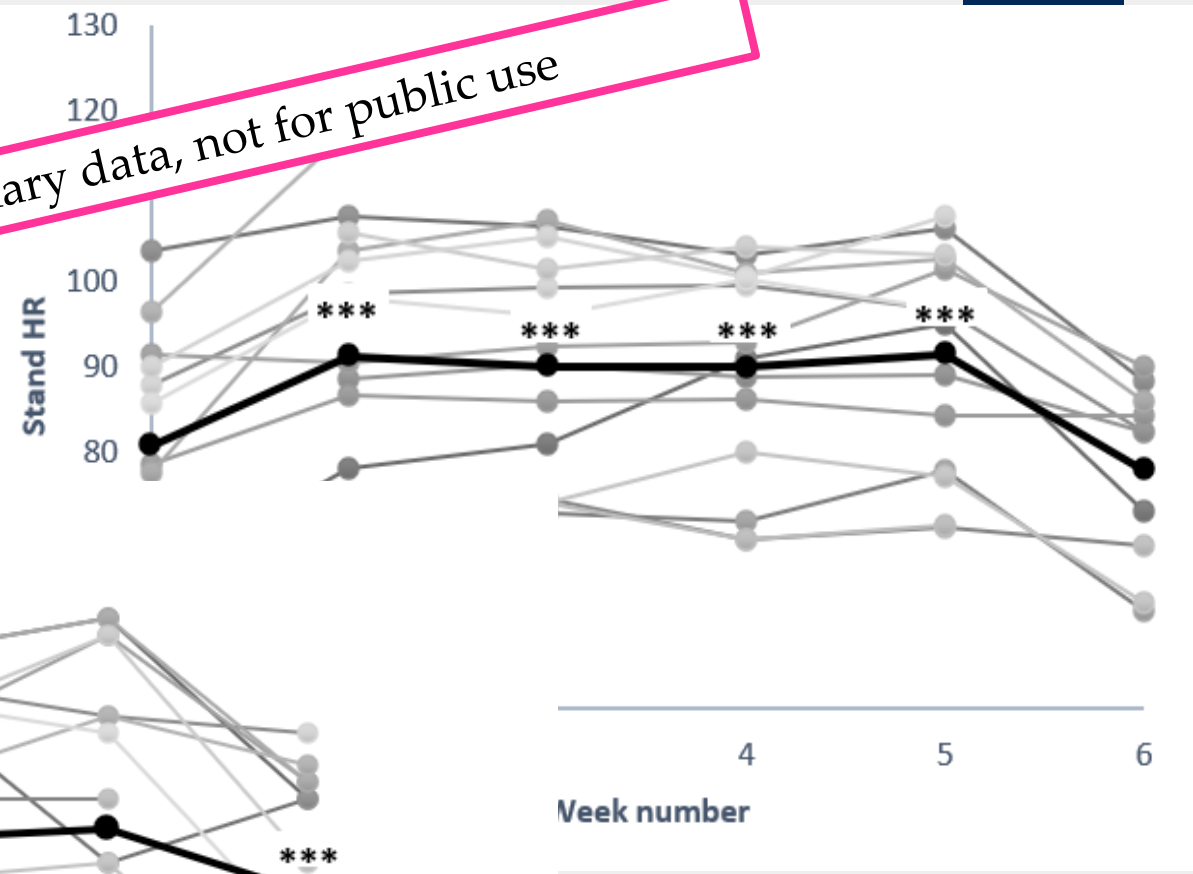


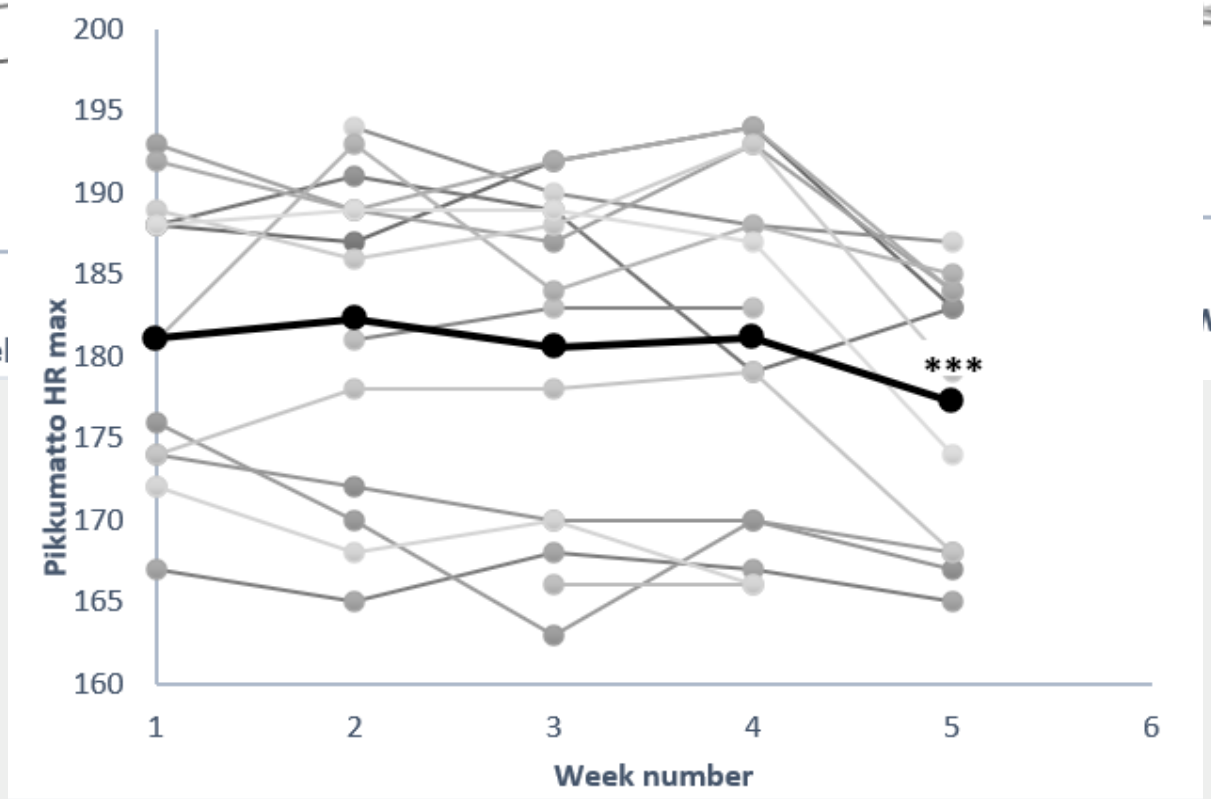
Change in Hb-mass (and EPO response) were indiviudal, but generally positive.

Increased Hb-mass is associated with increased time to exhaustion

Preliminary data, not for public use







Time at altitude reflected in resting and orthostatic HR

HRmax during testing decreased markedly after altitude period

Female physiology

Female physiology

- Endogenous hormonal millieus (also those influenced by exogenous hormones) training responses, training adaptations, performance, recovery… **what don't we know?**

- Several multidiciplinary projects *(data collection completed, in progress, and to be colllected later this year)*
- Two female physiology related reviews *(in progress)*

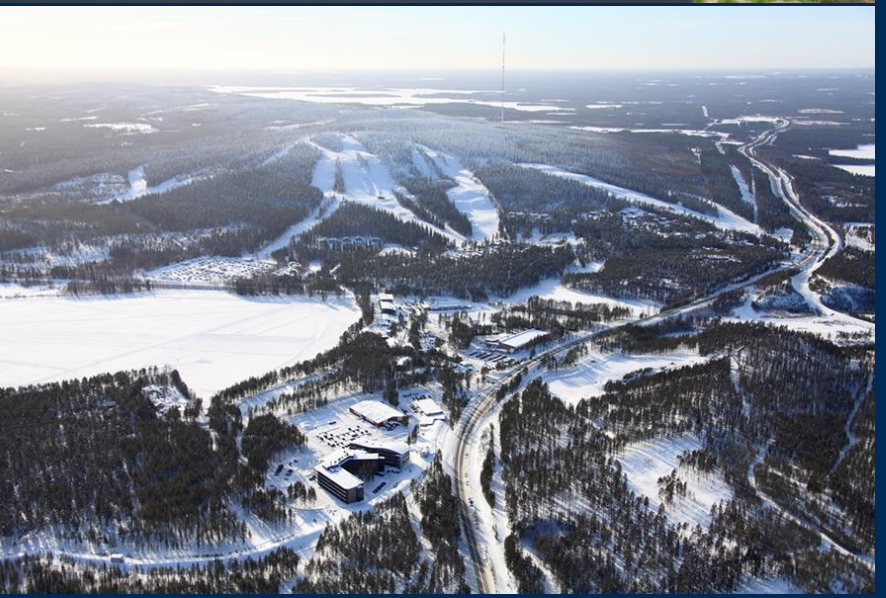
Target population: Athletes (individual and team sport) **AND** physically active females

- / Funding for high-performance research is sparse
- / Projects manipulating training logical to "pilot" in physically active females (including overweight)

ritva.s.taipale@jyu.fi
@RituTM

johanna.k.ihalainen@jyu.fi
@jokasten

PhD students:
Essi Ahokas
Oona Kettunen
Anuliisa Lähitie
Ida Löfberg
Suvi Ravi
Vera Salmi
Eero Savolainen



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Thank you!

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Coaching women

Are they just small men?

Ritva Mikkonen, PhD

Sports Technology Unit, Vuokatti

Faculty of Sport and Health Sciences

University of Jyväskylä

- **Aims:**

- To understand the role of menstrual cycles and hormonal contraceptives in health and performance of female athletes.

- To remind you to never make a woman/girl/person who menstruates feel gross/guilty/uncomfortable talking about what their bodies naturally do.

Included topics:

- A couple of questions
- Women are **not** just smaller versions of men
- Unique hormonal profiles
  - Let's talk about the menstrual cycle!
  - Hormonal contraceptives
  - Ovarian steroids are **not** just reproductive hormones

→ What do these mean in sport?

Is there a lack of sport/exercise research in women?

2014–2020

63% of publications included both women and men

31% of publications included only men only

6% of publications included women only

When analyzing participants included in all journals:
8,253,236 **(66%) were men** and 4,254,445 **(34%) were women**

(Cowley et al. 2021)


Women in Sport and Physical Activity Journal, 2021, 29, 146-151
https://doi.org/10.1123/wspaj.2021-0028

Human Kine

"Invisible Sportswomen": The Sex Data Gap in Sport and Exercise Science Research

Emma S. Cowley,[1] Alyssa A. Olenick,[2] Kelly L. McNulty,[3] and Emma Z. Ross[4]
[1]Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, United Kingdom;
[2]Integrative Cardiovascular Physiology Laboratory, Department of Kinesiology, University of Georgia, Athens, GA, US
[3]Department of Sport, Exercise and Rehabilitation, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom; [4]The Well HQ, BBE Health Ltd, London, United Kingdom


Sport, exercise and the
cycle: where is the researc

G Bruinvels,[1,2,3] R J Burden,[2,3,4] A J McGrego
M Dooley,[7] T Richards,[1] C Pedlar[2,6]

Consideration of Sex as a Biological Variable in NIH-funded Research


problem of implicit gender bias in sport and exercise medicine

Sheree Bekker,[1] Osman H Ahmed,[2,3] Ummukulthoum Bakare,[4,5]
Tracy A Blake,[6,7] Alison M Brooks,[8] Todd E Davenport,[9]
Luciana De Michelis Mendonça,[10] Lauren V Fortington,[11]
Michael Himawan,[12] Joanne L Kemp,[13] Karen Litzy,[12] Roland F Loh,[14]

European Journal of Sport Science, 2014
http://dx.doi.org/10.1080/17461391.2014.911354

ORIGINAL ARTICLE

Where are all the female participants in Sports and Exercise Medicine research?

IOSEPH T. COSTELLO[1], FRANCOIS BIEUZEN[2], & CHRIS M. BLEAKLEY[3]

Is there a lack of high-quality research in women?

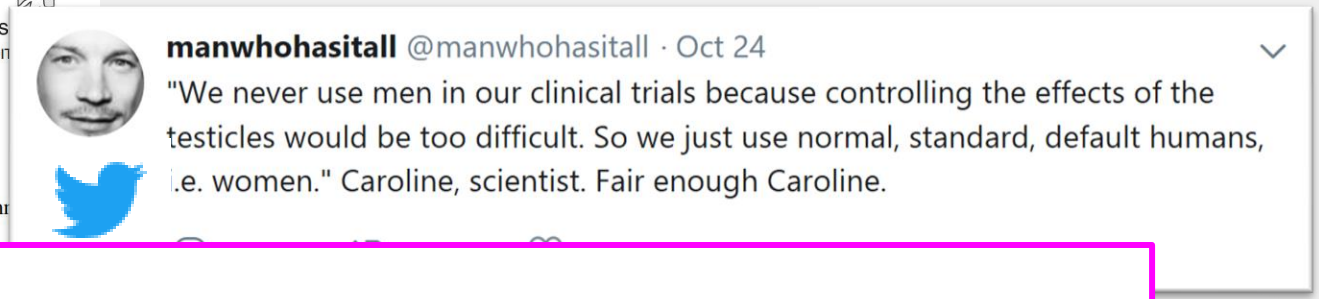
International Journal of Sports Physiology and Performance, (Ahead of Print)
https://doi.org/10.1123/ijspp.2019-0514
© 2019 Human Kinetics, Inc.

Human Kinetics

Sport Science on Women, Women in Sport Science

As I, Iñigo Mujika, write these words, I have just completed the third week of an altitude training camp in Sierra Nevada, Spain (2320 m) to be held usual in support champion camp is are wom 2 women my caree opportun first scien of this st 10 males wanted to training a group of trained na in this stu women fr complica

extra mile" (eg, monitoring their menstrual cycle and comm cating with researchers) to contribute.



manwhohasitall @manwhohasitall · Oct 24

"We never use men in our clinical trials because controlling the effects of the testicles would be too difficult. So we just use normal, standard, default humans, i.e. women." Caroline, scientist. Fair enough Caroline.

Several factors in research are not controlled for OR reported

→ is this behind heterogeneous results?

→ have we missed something important?

CURRENT OPINION

Check for updates

Methodological Considerations for Studies in Sport and Exercise Science with Women as Participants: A Working Guide for Standards of Practice for Research on Women

Kirsty J. Elliott-Sale[1] · Clare L. Minahan[2] · Xanne A. K. Janse de Jonge[3] · Kathryn E. Ackerman[4] · Sarianna Sipilä[5] · Naama W. Constantini[6] · Constance M. Lebrun[7] · Anthony C. Hackney[8]

MYTHS AND METHODOLOGIES

WILEY EP Physiology

Myths and Methodologies: Reducing scientific design ambiguity in studies comparing sexes and/or menstrual cycle phases

Stacy T. Sims[1] | Alison K. Heather[2]

Women are generally smaller than men...

...but are not smaller versions of men

*not all 'women' are the same

Let's talk about the menstrual cycle

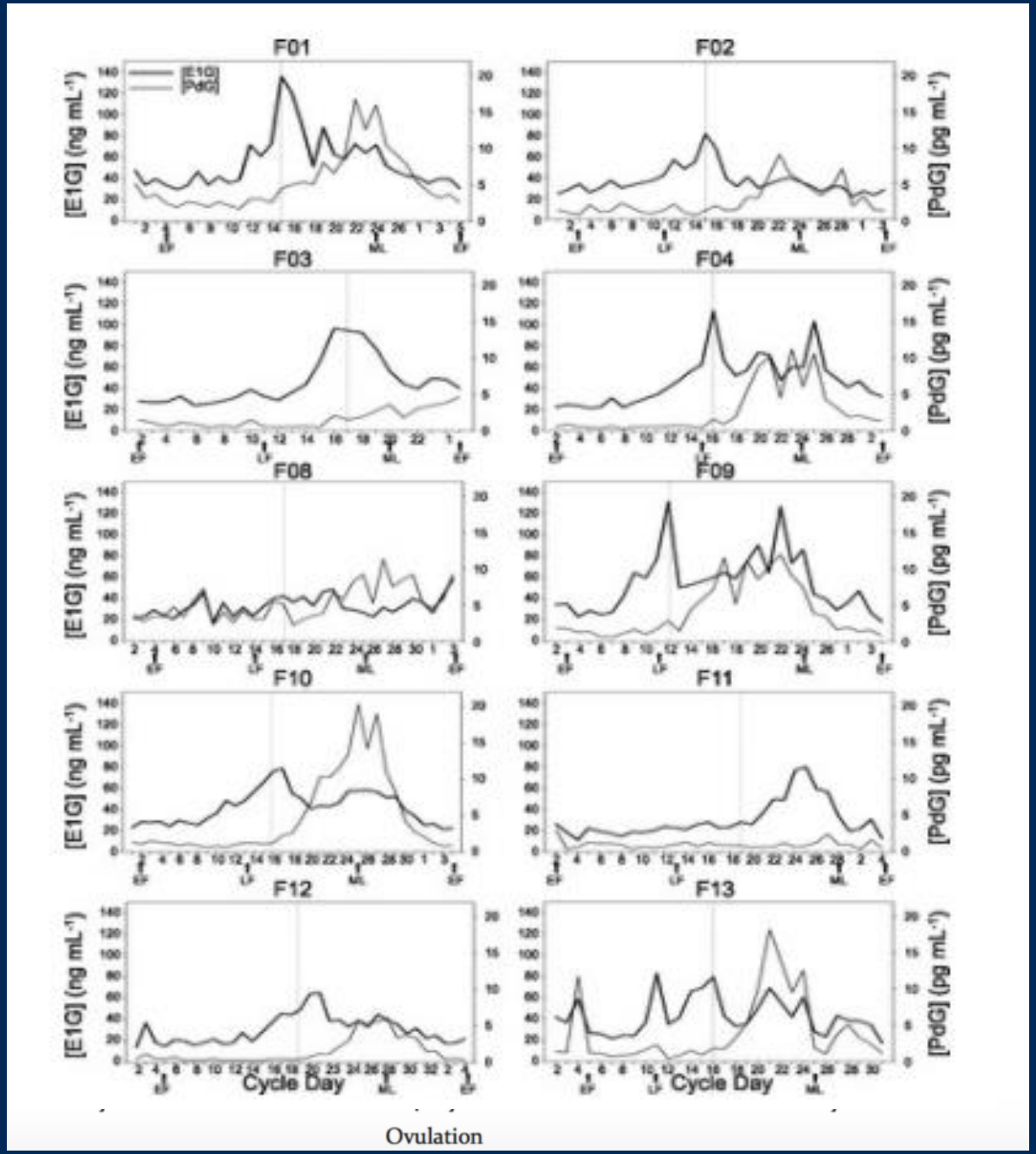
(menstrual dysfunction & hormonal contraceptive use)

Menstrual cycle

- Begins at ~13 years of age
- Ends around 50 years of age
- Cycle length 28-35 days
  - Menses 2-7 days

- 2 phases (follicular and luteal) separated by ovulation
  - *Follicular and luteal phases can be further be divided into early, mid or late (7 phases!)*

- Unfortunately

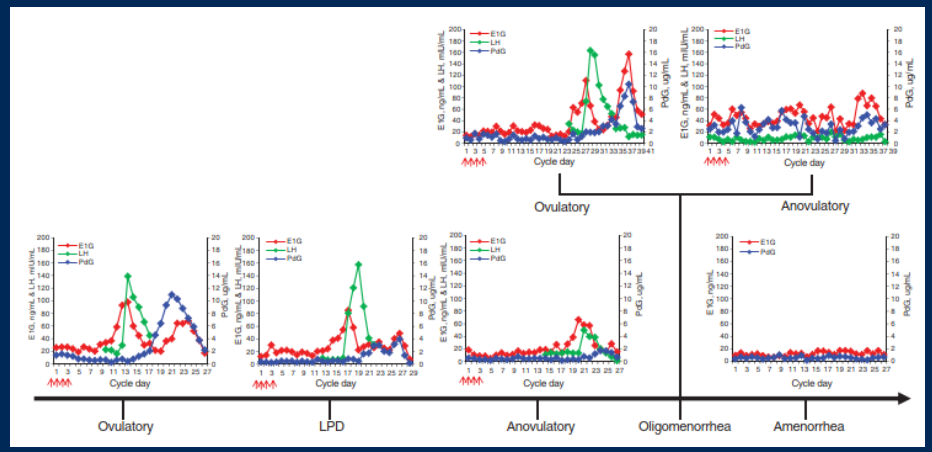


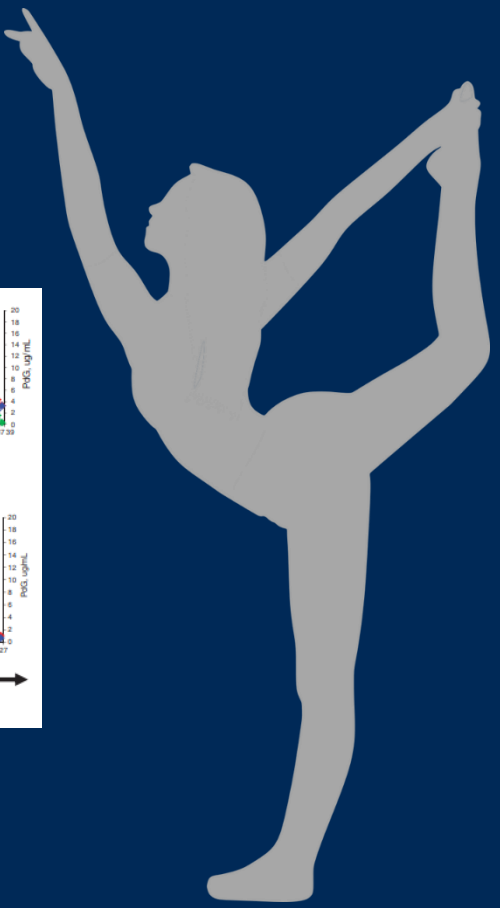
MacNutt et al. (2012) https://journals.physiology.org/doi/full/10.1152/japplphysiol.00727.2011

Menstrual status – why should you care?

The menstrual cycle is an indicator of homeostasis and health
- the absence or delay of menstruation should always be investigated

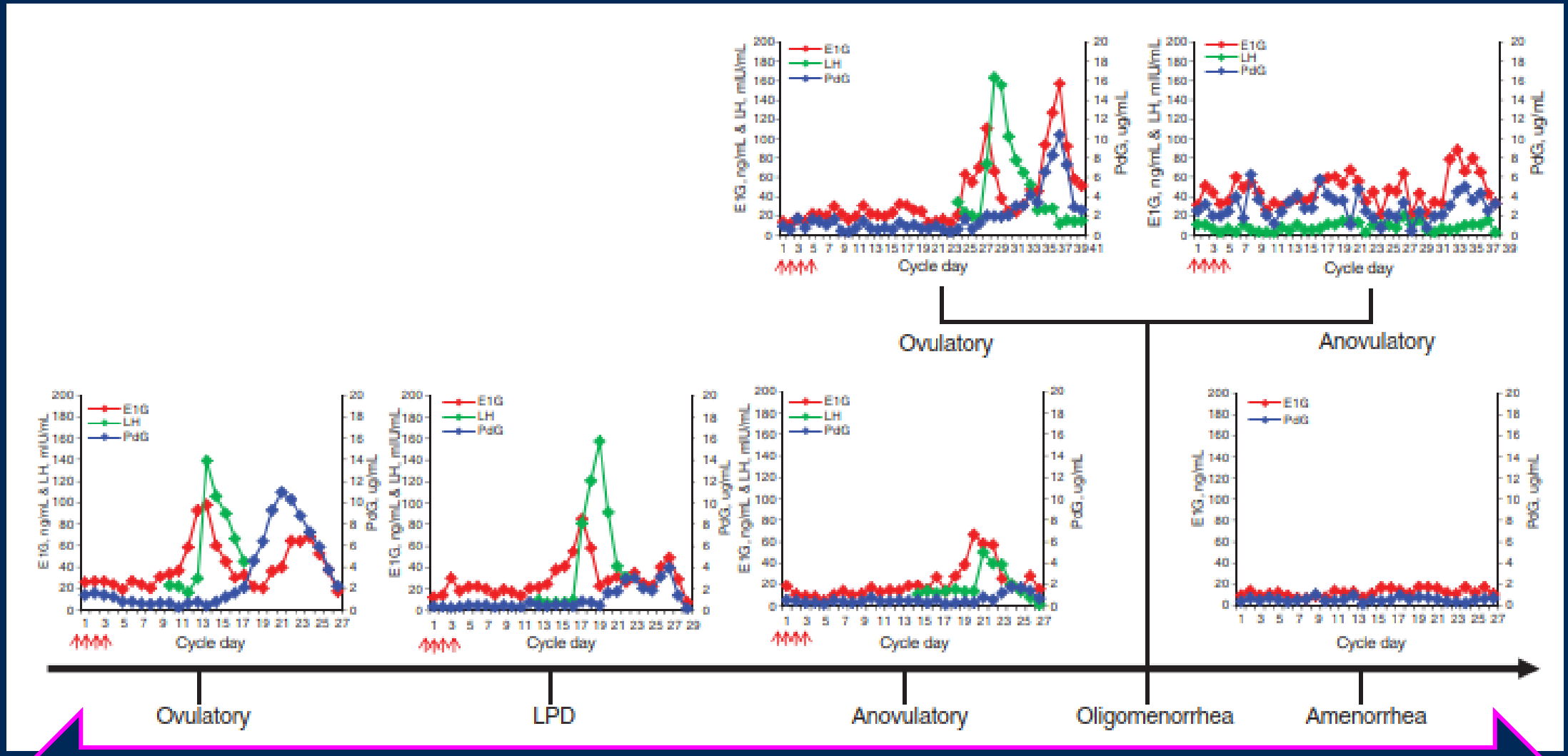
- **Can be influenced by several variables:**
  - Age (puberty, perimenopause, menopause…)
  - Pregnancy (miscarriage) and lactation
  - Hormonal contraceptive use
  - Stress!
  - Diet
  - Exercise
  - Circadian variation (sleep)
  - Gynecological illnesses (e.g. PCOS, endometriosis…)





Menstrual status – why should you care?

Allaway et al. 2016 *Hormone Molecular Biology and Clinical Investigation*
https://doi.org/10.1515/hmbci-2015-0053



Terminology

TERM	DEFINITION
Eumenorrhea	Menstrual cycle length is 21-35 days resulting in ≥ 9 consecutive periods per year. There is evidence of LH surge and correct hormonal profile and no HC use 3 months prior
Primary amenorrhea	Failure to reach menarche by age 15 years when development of secondary sexual characteristics is evident. OR Failure to reach menarche by age 14 years when no secondary sexual characteristics are present.
Secondary amenorrhea	Absence of more than 3 consecutive periods in non-pregnant women with past menses that may be caused by gynecological illness or low energy availability
Luteal phase deficiency	Menstrual cycles with <16 nmol·L−1 of progesterone based on a single luteal phase progesterone measurement
Oligomenorrhea	Menstrual cycle length is > 35 days
Anovulation	Menstrual bleeding without ovulation
Polymenorrhea	Menstrual cycle length is < 21 days
Primary dysmenorrhea	Menstrual bleeding is accompanied by significant pain from the first menstrual period (concomitantly other symptoms may be present such as nausea, vomiting, diarrhea, fatigue, fever, irritability, muscle pain, dizziness and/or headache)
Secondary dysmenorrhea	Previously unpainful menstrual bleeding that typically is secondary to gynecological illness (concomitantly other symptoms may be present such as nausea, vomiting, diarrhea, fatigue, fever, irritability, muscle pain, dizziness and/or headache)
Menorrhagia	Menstrual bleeding that is abnormally heavy (>80ml) or prolonged (> 7 days) and negatively affects daily function

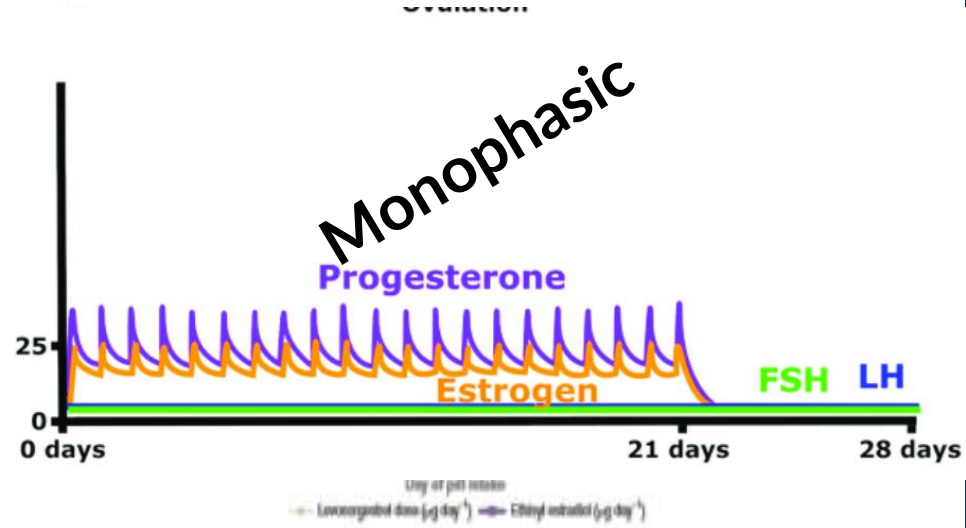


FIGURE 2 Daily exogenous hormone dosage, in micrograms, for monophasic oral contraceptive (data derived from Wyth Pharmaceuticals, Alesse-28)

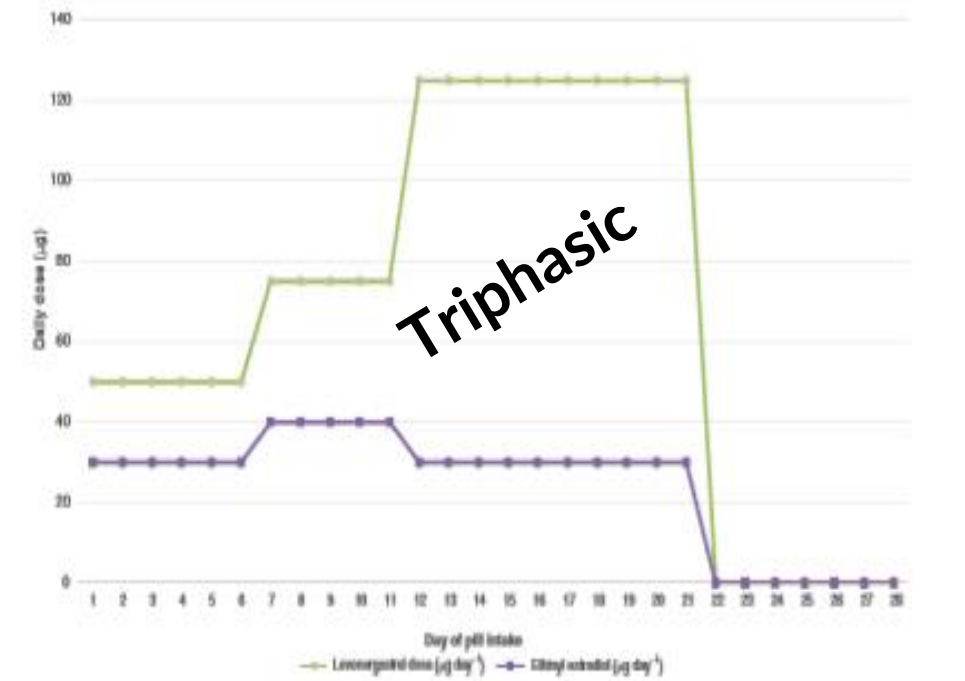


FIGURE 3 Daily exogenous hormone dosage, in micrograms, for triphasic oral contraceptive (data derived from Berlex Laboratories, Tri-Levlen 28)

What about hormonal contraceptives?

ANOTHER CHALLENGE:

Up to 70% of athletes use HC (Martin, Sale, Cooper, & Elliott-Sale, 2018)

Different delivery methods, doses...

- Monophasic – *constant dose for 3 weeks*
  - *But hormone profile isnät 100% ”stable”*
- Triphasic – *varying dose over 3 weeks*

Endogenous hormone profiles differ w/ dose & brand
(Elliot-Sale et al 2013)

What is the reason behind HC use?

Sims and Heather (2018) and Chidi-Ogbolu and Baar (2019)

Ovarian steroids are not just reproductive hormones

estrogens and progesterone,

Ovarian steroids (hormones that fluctuate during the menstrual cycle) also act on:

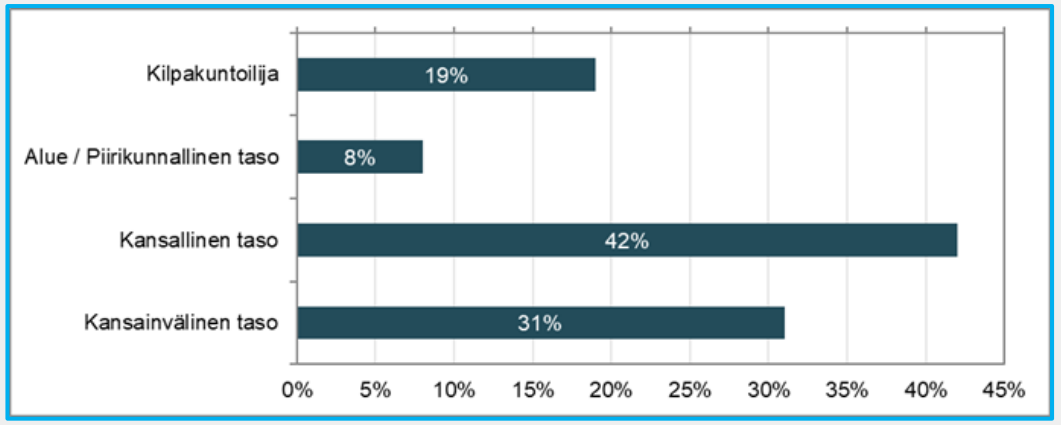
- **TISSUES:** *muscle, nervous, epitheilal, and connective*
- **PHYSIOLOGICAL PROCESSES:** *metabolism, cardiovascular, pulmonary (ventilation), autonomic, immunity, gastrointesitinal, genitourinary, cognition*

*It's reasonable to **hypothesize** that the non-reproductive functions of ovarian steroids could influence e.g. acute responses to exercise and perhaps even longer-term adaptations.*

*Preliminary **Naisurheilija 2.0** results (n = 885)*

Cooperation between **Univeristy of Jyväskylä** and
Research Institute for Olympic Sports (KIHU)

Summer 2020



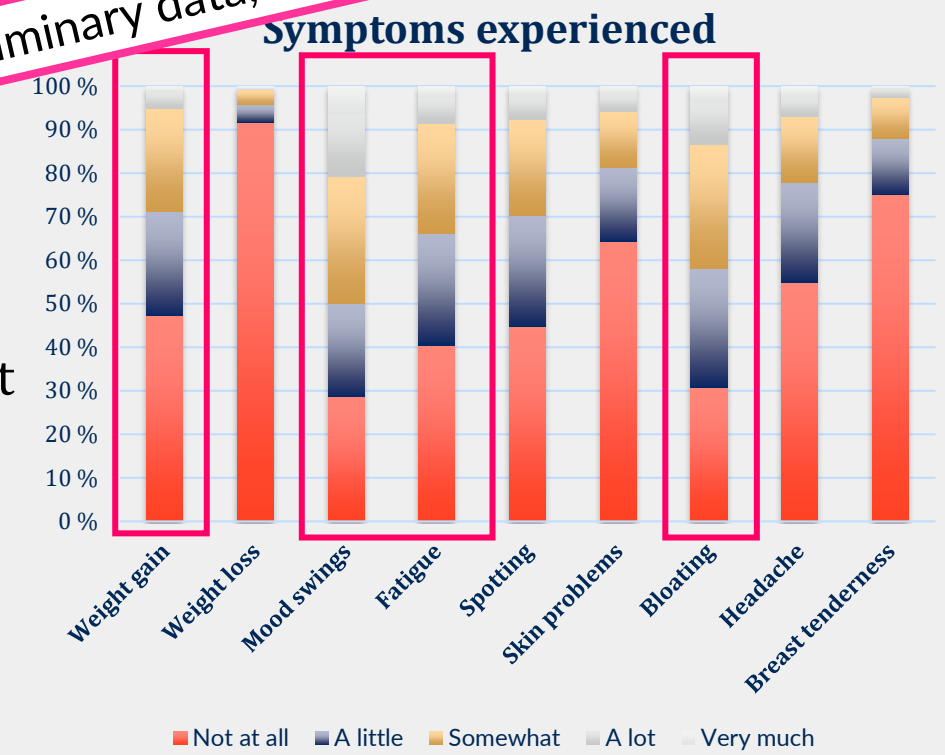
*Preliminary **Naisurheilija 2.0** results (n = 885) → hormonal contraception*

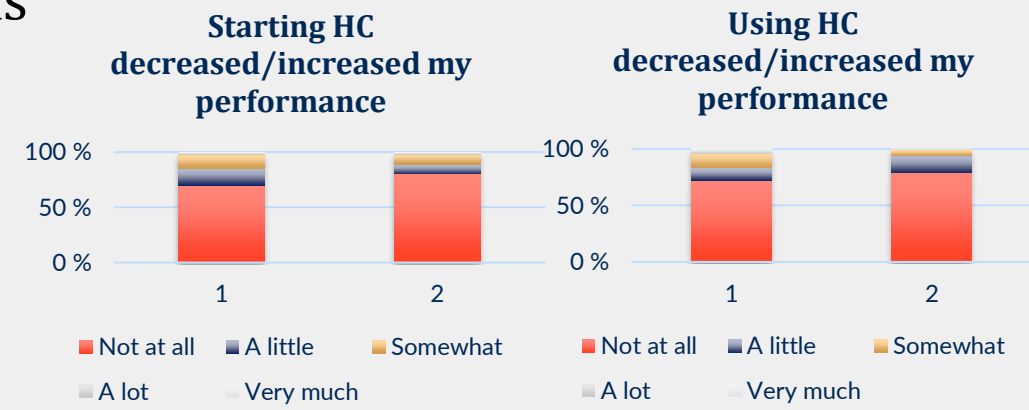
Preliminary data, not for public use

- **59%** athletes **DO NOT** use hormonal contraceptives
- **41%** athletes use hormonal contraceptives
  - **12%** have used hormonal contraceptives sometime in the past

- **Hormonal contraceptives used:** 52% combined hormonal contraceptives + 13% ”mini” pill + 26% IUD (hormonal or copper) + 4% capsule + 4% ring

- **37%** hormonal contraceptive users have PMS symptoms
- **40%** non-users have PMS symptoms



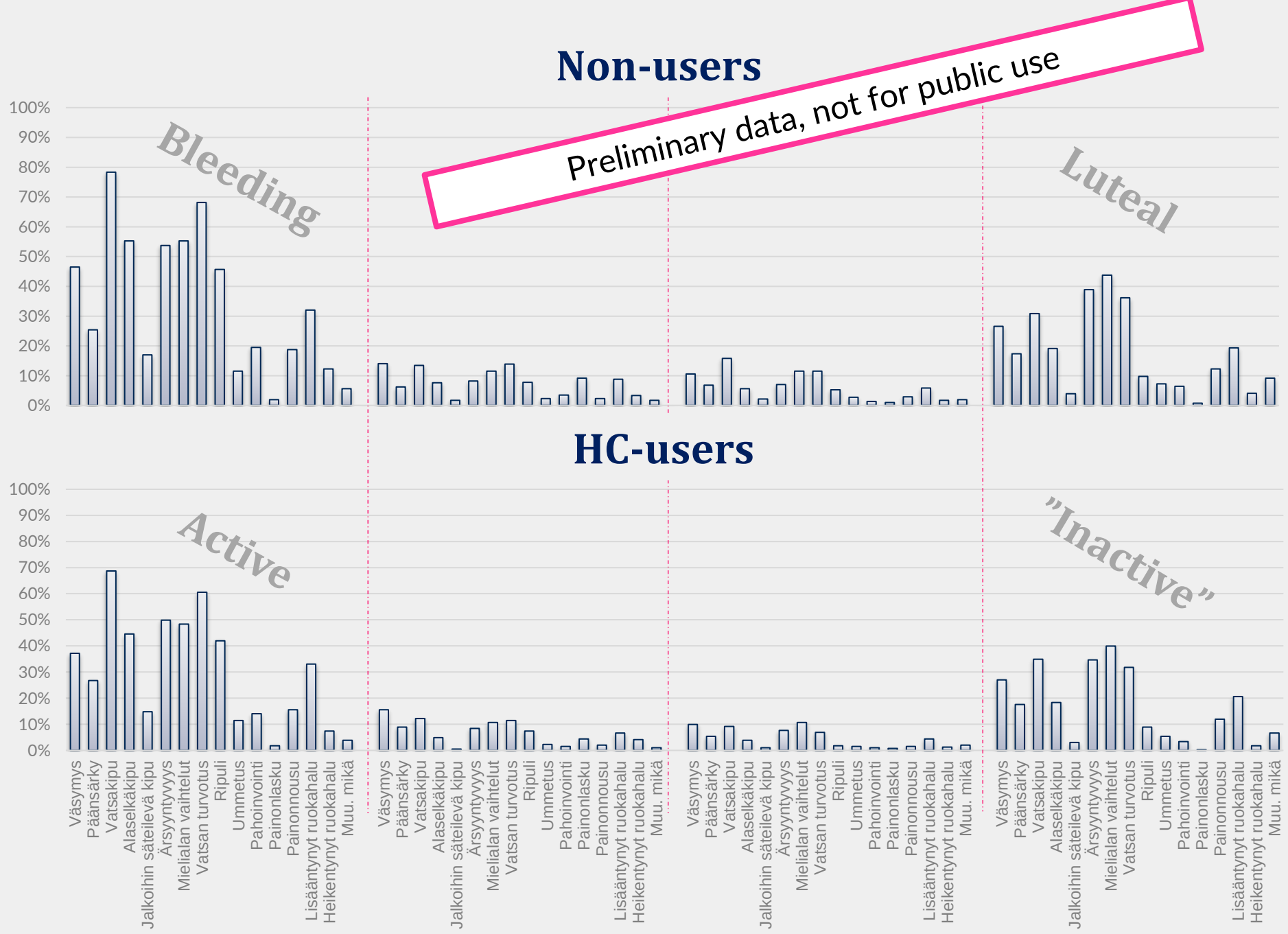


Oireet

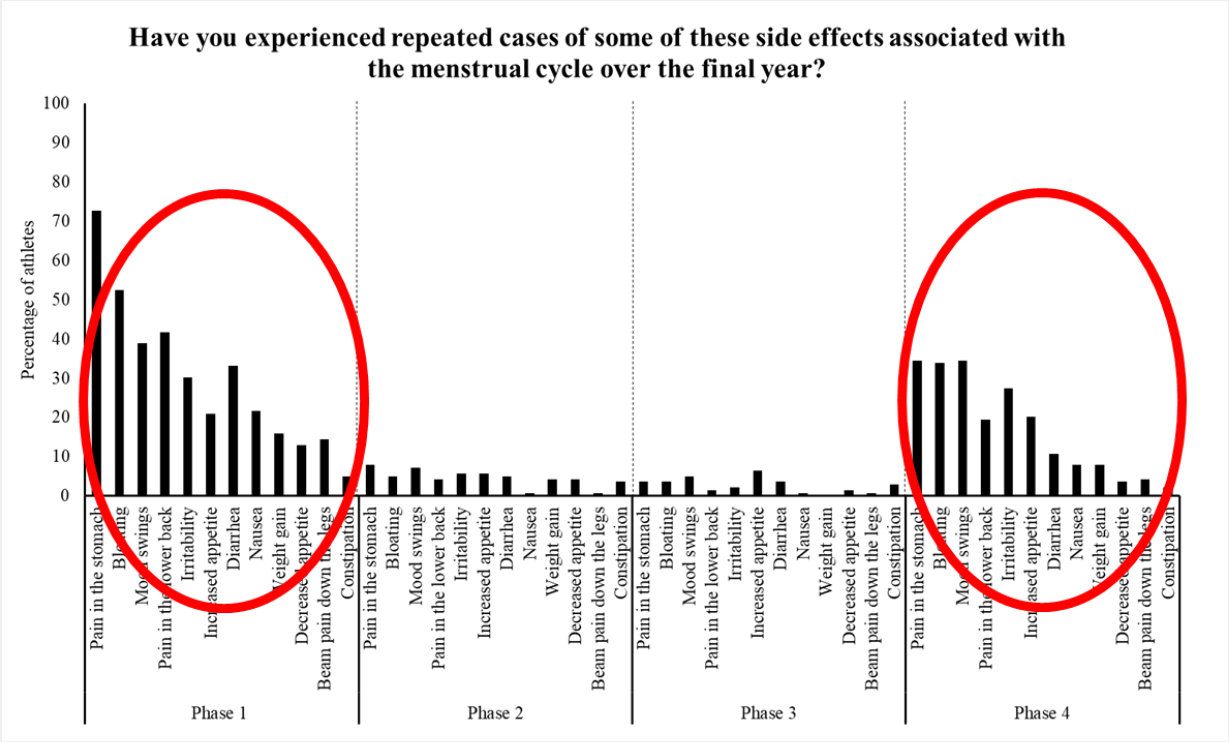
Have you regularly observed (more than once) any of the following symptoms related to your cycle during the last year viimeisen vuoden aikana?

No difference between HC users and non-users.

What can we do to mitigate unpleasant symptoms related to ”cycles”?



- **Effect of the menstrual cycle on ”performance”**
  - 140 Norwegian Nordic skiers / biathletes
  - Questionnaire: 48% TOP30 MC
  - 70% **Cycle affects peformance**
  - 70% **Use pain medication**
  - 50% **Change their training plans**
  - **LESS THAN 30% talk about their cycle and symptoms with their coaches**



International Journal of Sports Physiology and Performance, (Ahead of Print)
https://doi.org/10.1123/ijspp.2019-0616

Human Kinetics
ORIGINAL INVESTIGATION

Changes in Self-Reported Physical Fitness, Performance, and Side Effects Across the Phases of the Menstrual Cycle Among Competitive Endurance Athletes

Guro S. Solli, Silvana B. Sandbakk, Dionne A. Noordhof, Johanna K. Ihalainen, and Øyvind Sandbakk

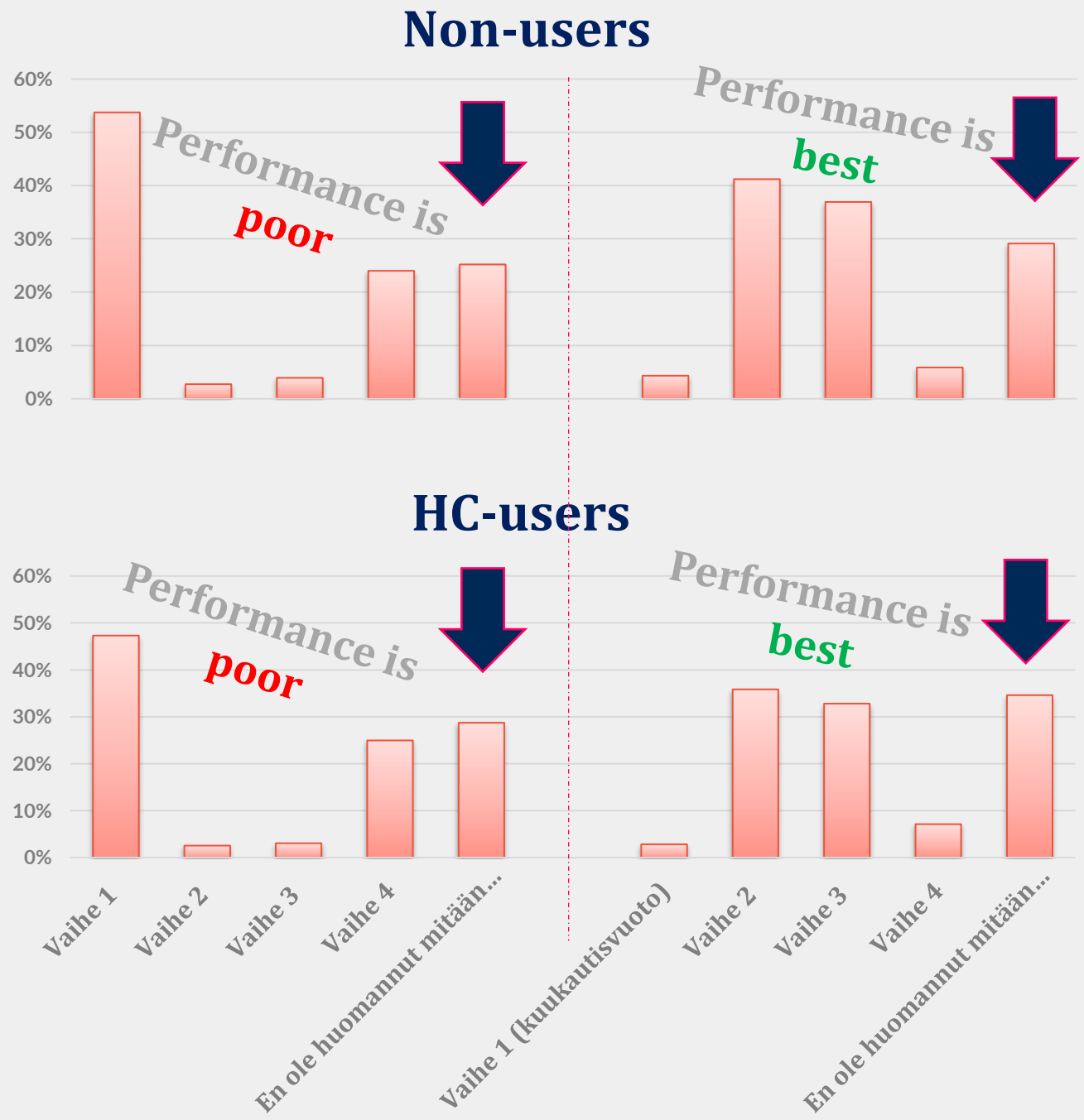
Performance

In which phase of your cycle do you feel your ”performance” is **POOR?**

ja

In which phase of your cycle do you feel your ”performance” is **THE BEST**?

DO NOT assume that cycles affect athletes
DO NOT make cycles a problem

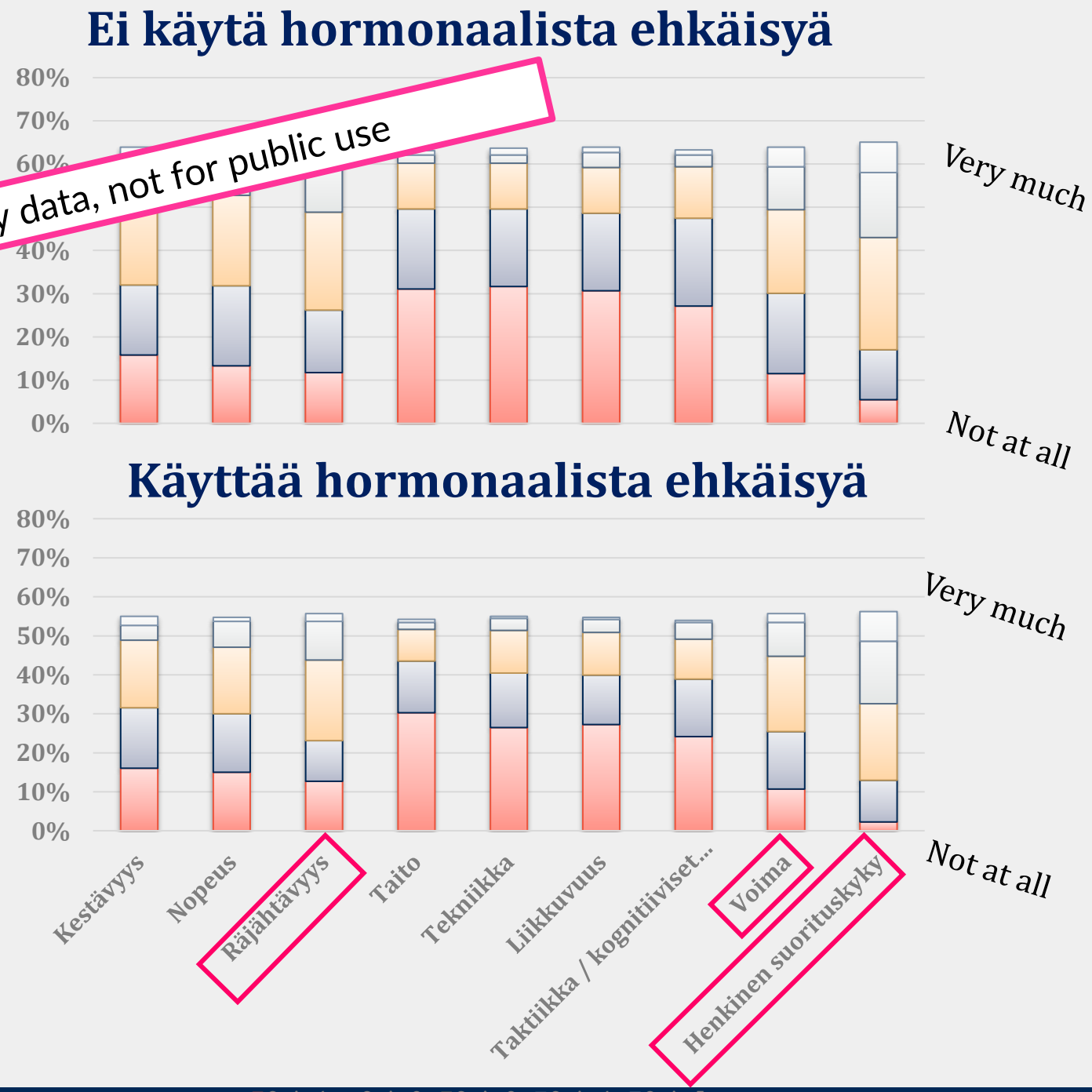


Performance

Preliminary data, not for public use

What characteristics or skills associated with performance are affected by your cycle and how much?

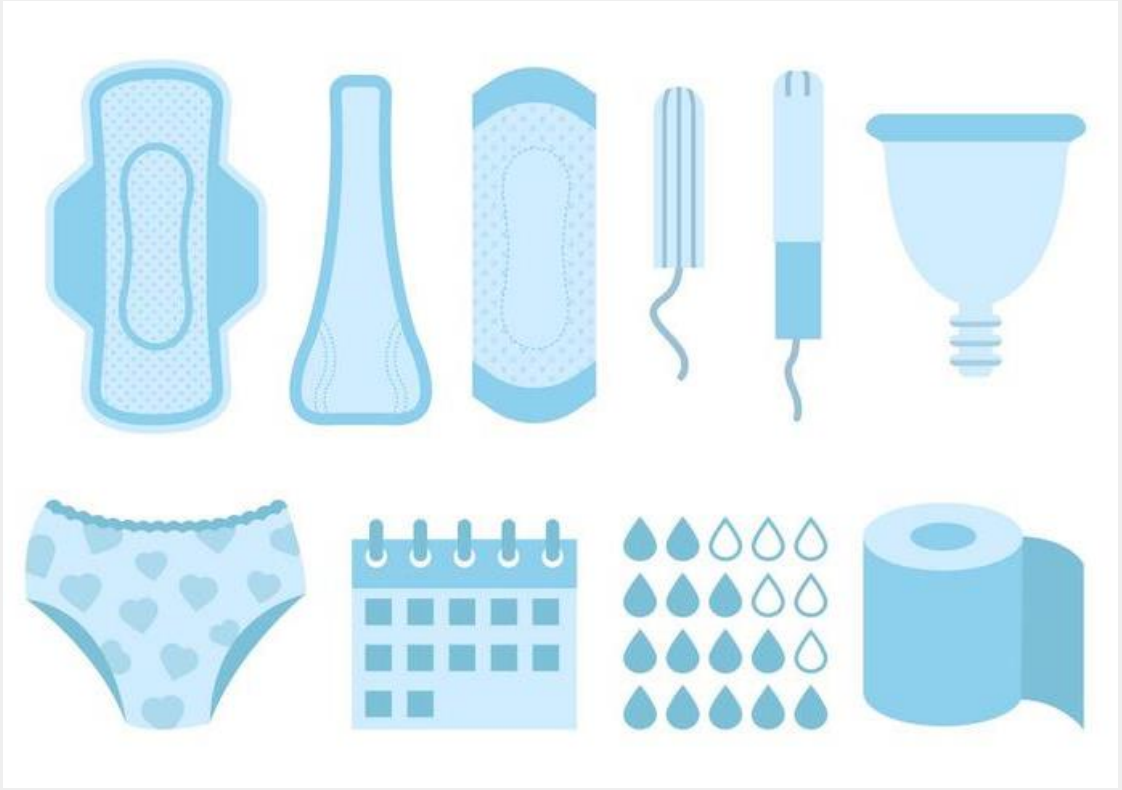
Power, strength, (endrance, speed) and MENTAL PEFORMANCE are affected



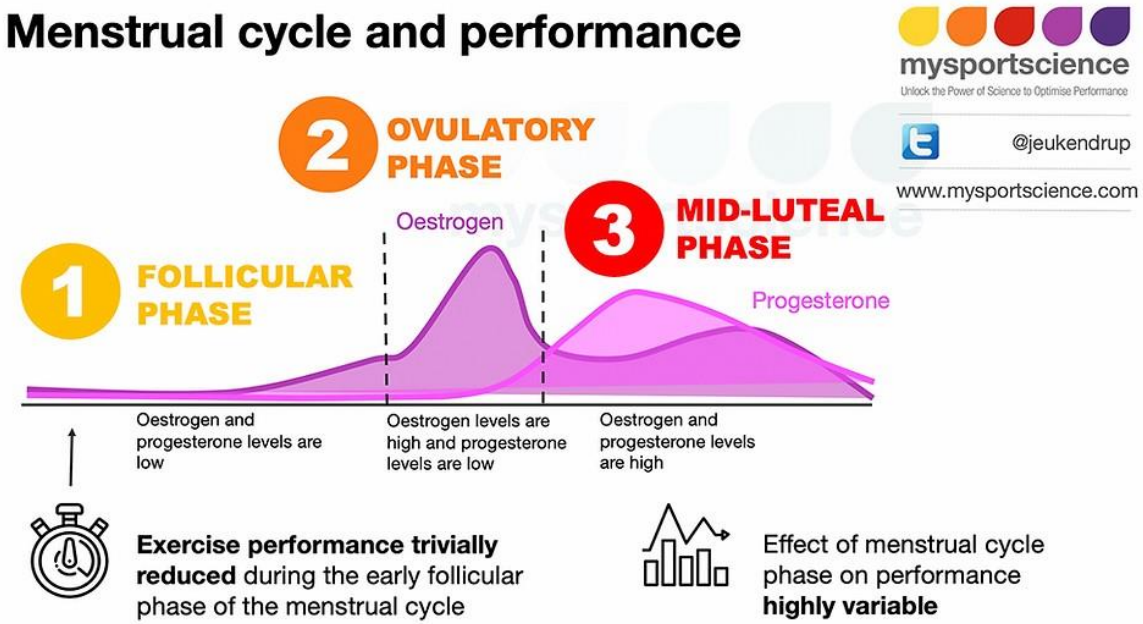
I want you, as coaches, to understand the role of menstrual cycles and hormonal contraceptives in health and performance of female athletes.

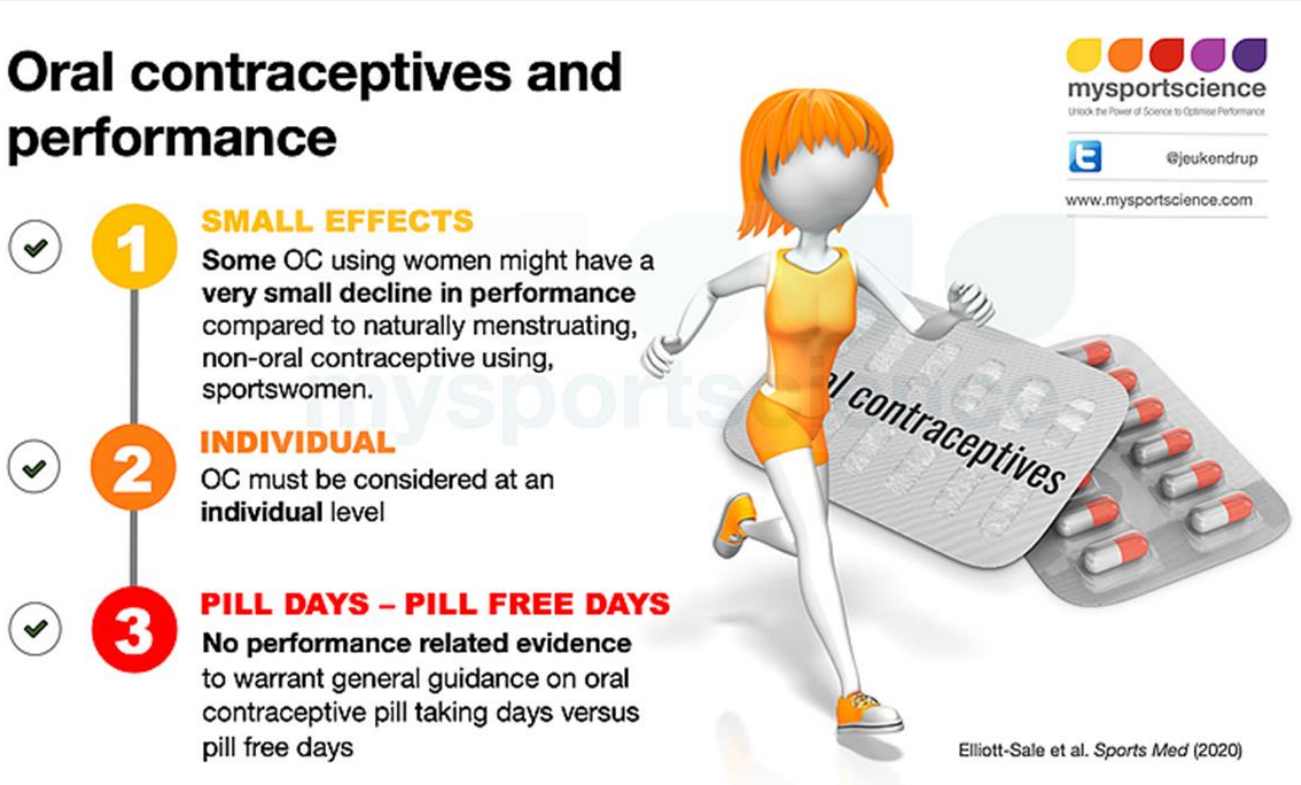
- Having a menstrual cycle is HEALTHY
- Not having a menstrual cycle (in absence of pregancy, lactation, or HC use is cause for concern) → seek help
- HC is a good tool for multiple reasons, but can't replace good nutrition and recovery (sleep)
- Taking note of symptoms or patterns of syptoms may be useful (for athletes and coaches)
- Anyone prescribing exercise according to the cycle is relying on a weak base of literature

I want you, as coaches, to never make a woman/girl/person who menstruates feel gross/guilty/uncomfortable talking about what their bodies naturally do.



Pads and tampons in your glove compartment, at the gym or in your bag and the knowledge that they are there is a good conversation starter (and these products are fantastic for first aid).





McNulty ym. 2020
https://doi.org/10.1007/s40279-020-01319-3

Elliot-Sale ym. 2020
https://doi.org/10.1007/s40279-020-01317-5

Kiitos

ritva.s.taipale@jyu.fi
@RituTM