INTERNATIONAL SOCIETY FOR SNOWSPORTS MEDICINE

36 SITEMSH Congress, Arosa

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Warm-Up and Cool-Down on race day in alpine skiing - where is the evidence?

Sassmann R.
Herfert J.
Wicker A.

Race day routine

- Early wake up, Hydration, Nutrition
- Activation, light work out and stretching
- At the mountain: warm up runs
- Inspection of the course, visualization
- Equipment check
- Warm up – final physical routine movements
- Starting routine, maximum focus
- 1. run
- Sitting/standing at the leader´s board, cooling down
- second preparation routine
- 2. run

Warming up

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main goals of WARMING UP

... improving (ski) performance

... (hopefully) reducing incidence of injury

What is known?

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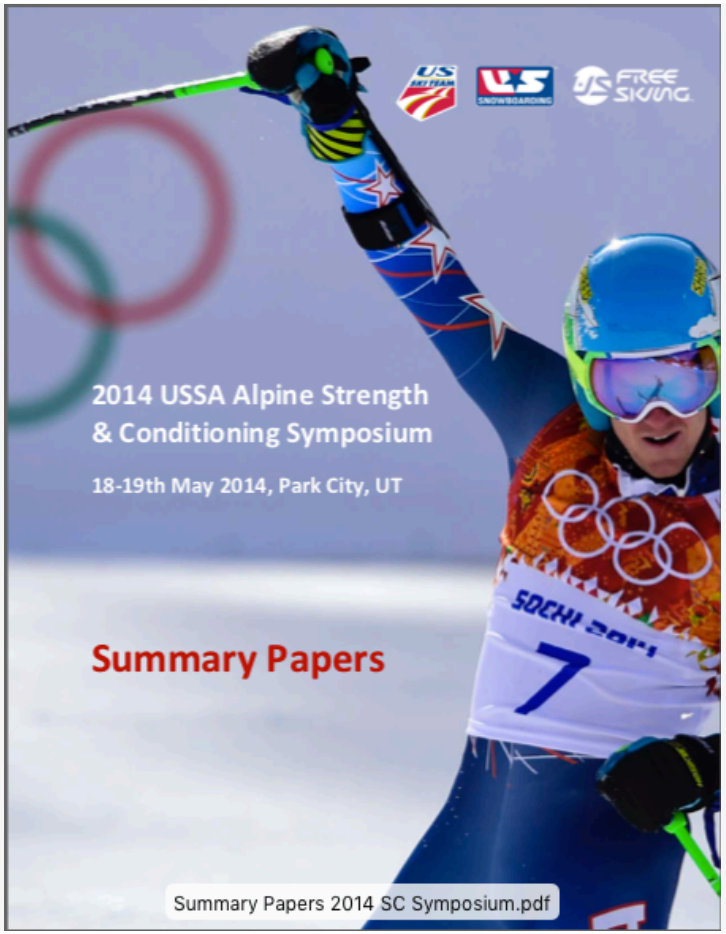
Warm Up and Recovery for Alpine Skiing

Michael Naperalsky, MS, CSCS at

2014 USSA Alpine Strength and Conditioning Symposium.



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Woods, K., Bishop, P., & Jones, E. (2007). Warm-up and stretching in the prevention of muscular injury. Sports Medicine, 37,

1089-1099.

Warming Up

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well-designed active dynamic warm-up consists of three components *(Naperalsky, 2014)*:

1. light cardiovascular activity

increasing breathing and heart rate,
increase metabolism,
initiate sweating
increasing circulation to allow the delivery of oxygen and nutrients while increasing muscle temperature to improve elasticity *(Woods, 2007).*

https://www.youtube.com/watch?v=UH7ZsMnkawk

Warming Up

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2. active mobility movements

increase joint and muscle range-of-motion,
and improve power outputs during exercise

http://www.sport-park-lech.at/de/aufwaerm-und-dehnuebungen-fuers-skifahren

Warming Up

3. dynamic speed movements

Activate CNS,

Adrenaline output increase,

Provision of energy increase,

Neuromuscslar coordination activation...

Warming Up

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special focus on:

- Core stability
  (high correlation with ACL, LBP, ...)

- pain/injuries/...
  (sensomotoric preparing, inter- & intramuscular)
- Personalized warm up

The New York Times

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Shiffrin warming up before a race in Italy. A multi-event threat, she has **almost twice as many points as** her closest pursuer in the World Cup overall standings. CreditStefano Rellandini/Reuters

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Cooling Down

Cooling DOWN (active!!!)

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Active cool down:

... Reach base level homeostasis again (CNS, hormones)

... Get in „regeneration modus“

... Decrease of lactate acid: **active faster than resting**

- 3min walk(White & Wells, 2015)
- Sport specific (Valenzuela et al., 2015)
- As fast as possible?!

Active cool down

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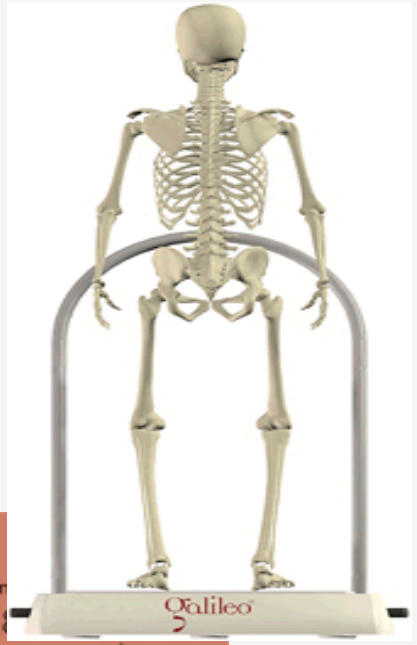
- **Whole body vibration?!**

Whole body vibration (Frequency 12-18Hz, 3-5x1min, 30sec rest) decreases:

- DOMS (VAS) (-50%)
- Creatinekinase (-40%)

(Timon et al., 2016)



Ground reaction forces

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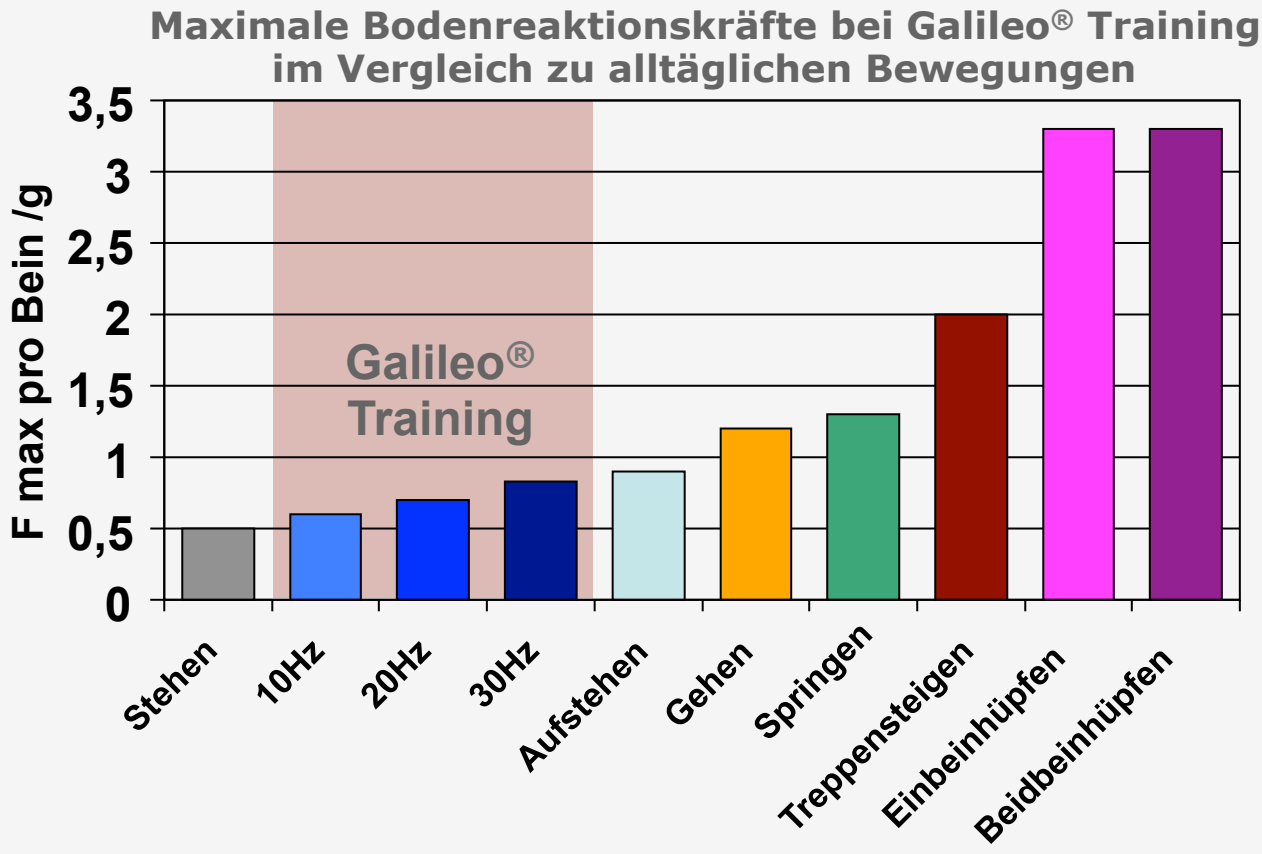

Cooling down (active!!!)

an appropriate recovery protocol also consists of several components

- recovery snack within 30 minutes of exercise (proteins and ch)
- Active “cool down” (walking, sport specific exercises, whole body vibration, ergometer)

Cooling DOWN (active!!!)

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- stretching or foam rolling to improve flexibility

No reduction of muscle tonus or stress factors.

Decrease of muscle soreness (DOMS)

Freiwald et al., 2016

Active cool down

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- Compression wear

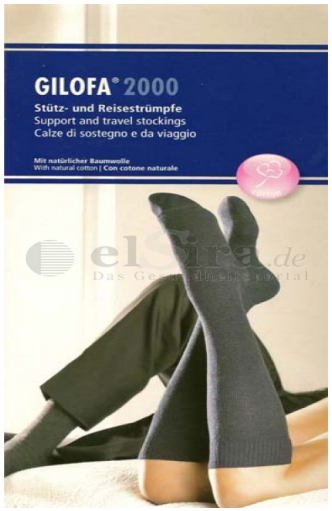
Compression garments,produce reductions in DOMS after different types of exercise.

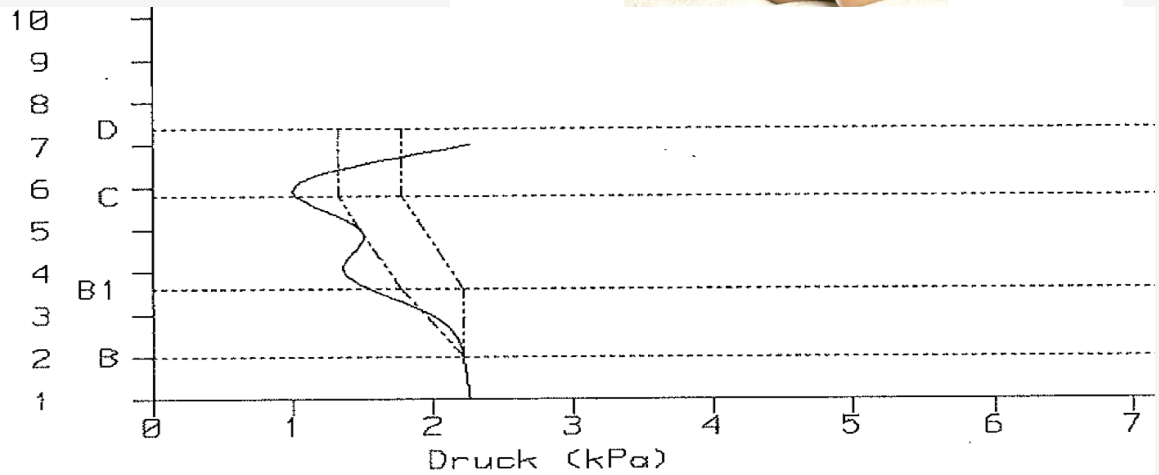
Compression clothing used during recovery reduces muscle swelling, reduces blood levels of creatine kinase, and increases tissue oxygen saturation.

Full leg (body) garments seems to be the most effective

Active cool down

- Medical product
- In sport KKL 2
- Regeneration KKL 1
- Trousers, suits





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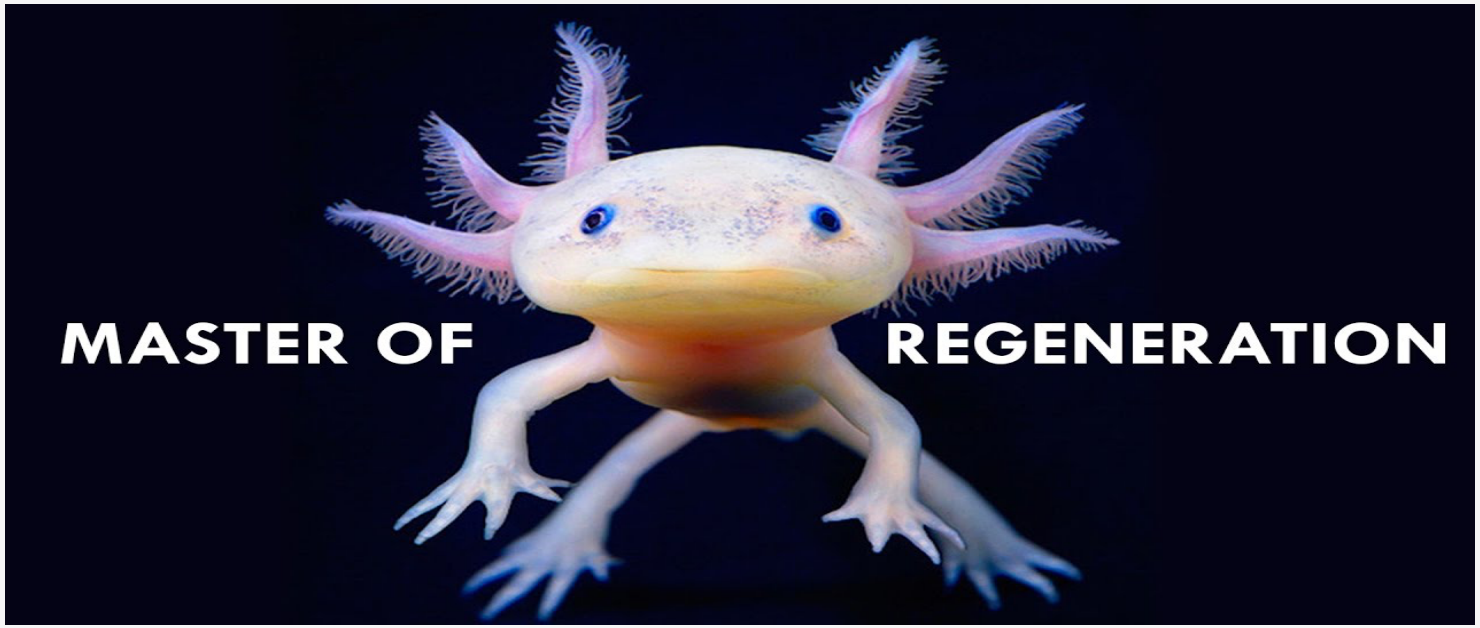
Regeneration of elite athletes in alpine skiing - what is known?

Herfert J.
Sassmann R.
Wicker A.

regeneration and/or tissue repair

regeneration vs repair



Cold water immersion (icewater)

- Cryotherapy
- Evidence:
- Reduces fatigue after 24/72h
- Fastens neuromuscular regeneration after24h

J Strength Cond Res. 2017 May;31(5):1443-1460
Effects of Cold Water Immersion and Contrast Water Therapy for Recovery From Team Sport: A Systematic Review and Meta-analysis. Higgins TR1, Greene DA, Baker MK.

Medical flossing

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- New discovered method
- Dr Kelly Starrett
- Only clinical observation
- Sponge effect
- Subcutane irritation
- Kinetic Resolve

Medical Flossing

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Medical flossing

Daraus ergab sich, dass durch mechanischen Druck (Kompressionsmanschetten), der von außen auf das Gewebe gebracht wird, vegetative Veränderungen ergeben. Bei der Stimulation von Mechanorezeptoren erfolgt eine Reduzierung der Sympathikusaktivität (Sato & Schmidt, 1977), auch postexzitatorische Depression genannt. Gleichzeitig kommt es durch diese Stimulation zu einer erhöhten Fluidität in der Extra-Zellular-Matrix. Das bedeutet, dass sich das wässrige Milieu verändert und der Wassergehalt der Grundsubstanz erhöht wird (Schleip, 2003). Seit geraumer Zeit ist demnach bekannt, dass extern auf den Menschen einwirkende Kompressionen durch die Kommunikation zwischen Nervensystem und Faszien unterschiedliche Effekte hervorrufen können. Dazu gehören u.a. die Schmerzlinderung, eine verminderte Muskelaktivität, erhöhte Durchblutung, ein verbesserte Resorption des Lymph- und Gefäßsystems und ggf. sogar höhere Hypertrophie-Effekte.

Medical Flossing

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- Narrative experience
- After strong exhaustion
- Flossing upper/lower extremity
- band from distal to proximal
- 50-75% pull
- 2 min walk
- Decrease pain and DOMS
- Start training earlier

Vitalfeld – Global diagnostic

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- No evidence
- Partly high effectivness - placebo
- Electromagnetic waves
- Measure and treat

Magnetic resonance therapy

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- Osteoarthrosis
- bone bruise
- micro fractures
- tendinosis
- osteoporosis
- regeneration

MBST® ProMobil

sleep

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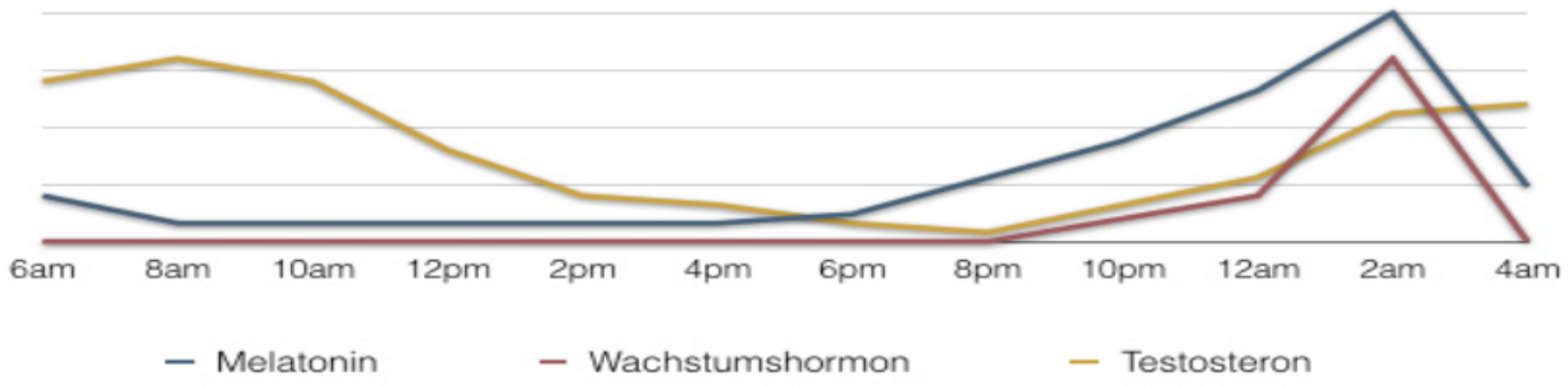

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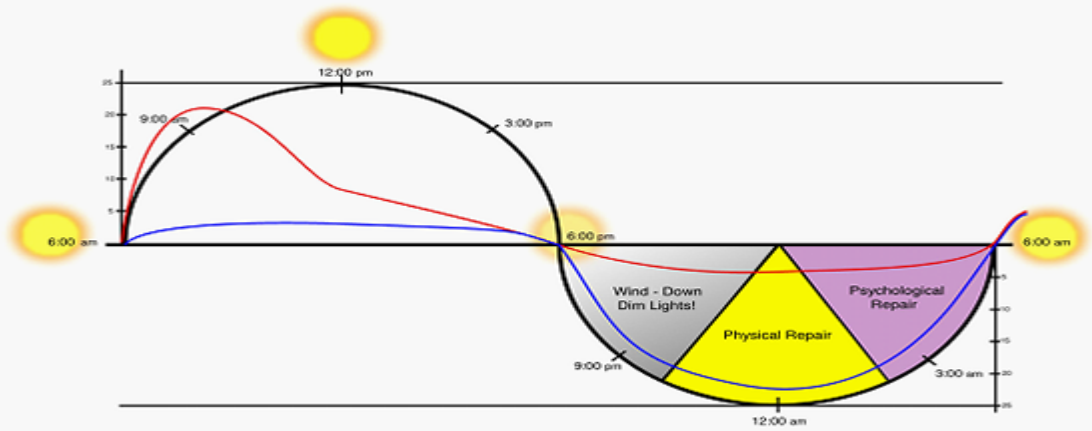
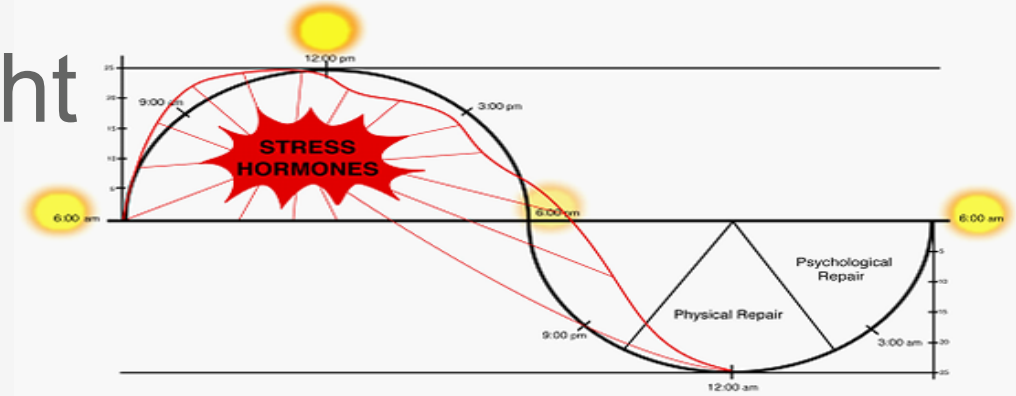
sleep



Cortisol

HGH

Sleep before midnight



Sleep HRV

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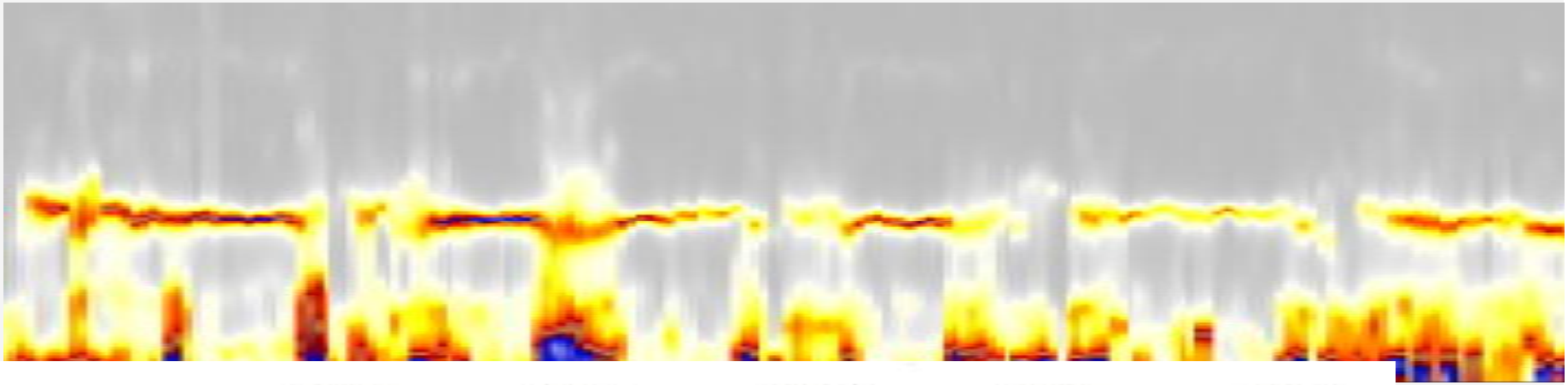

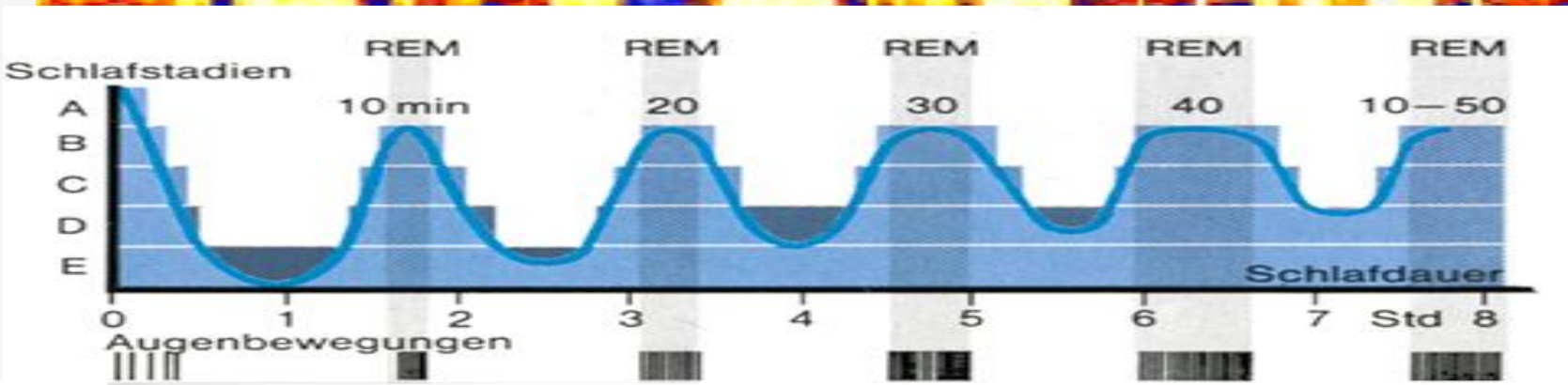

Sleep HRV

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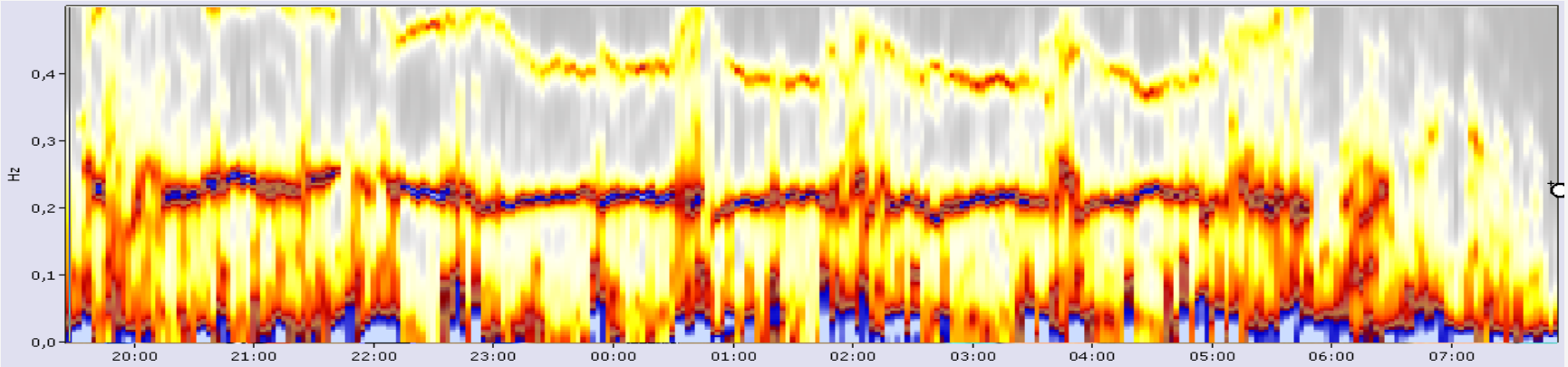

Easy handling
Very sensitive
Not specific

Sleep - Melatonine

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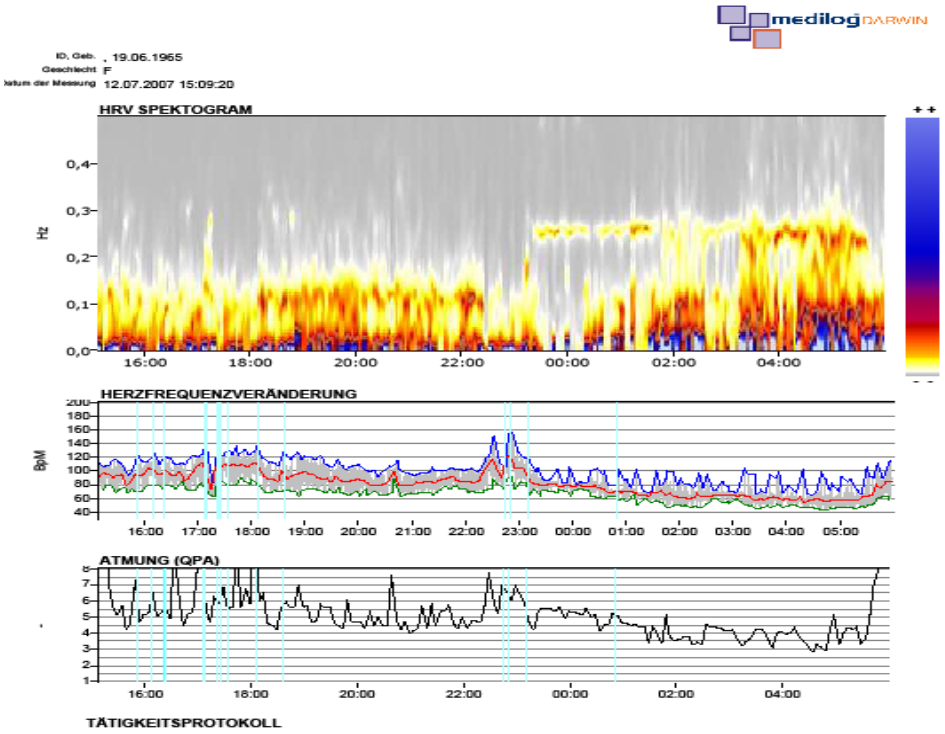

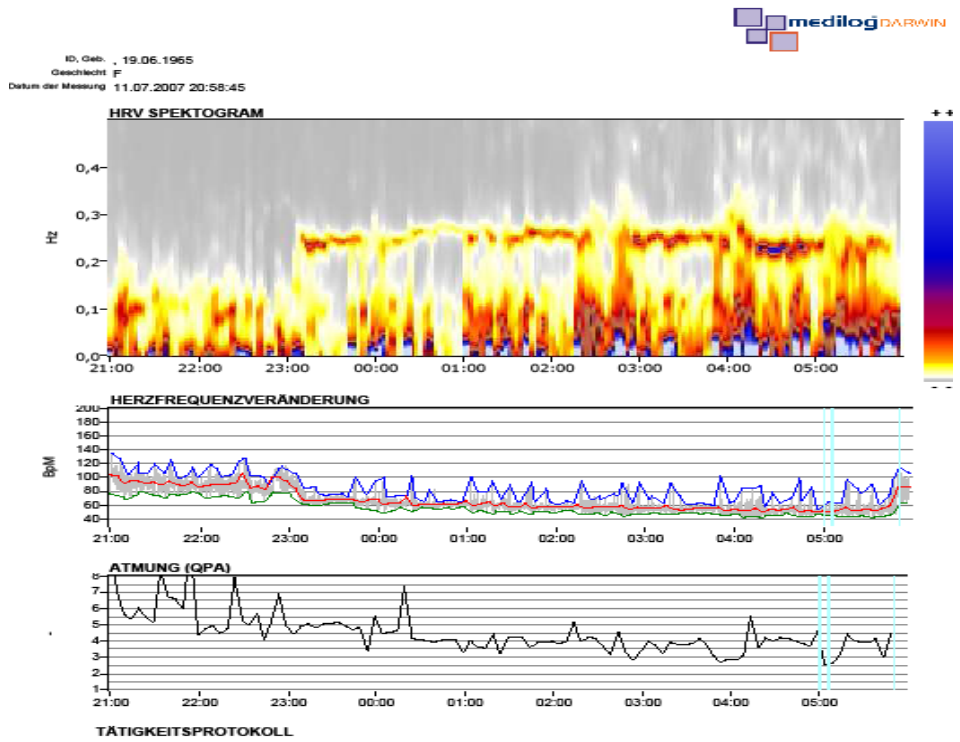

How much is too much

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Consensus statement

How much is too much? (Part 1) International Olympic Committee consensus statement on load in sport and risk of injury

Torbjørn Soligard,[1] Martin Schwellnus,[2] Juan-Manuel Alonso,[3] Roald Bahr,[3,4,5] Ben Clarsen,[4,5] H Paul Dijkstra,[3] Tim Gabbett,[6,7] Michael Gleeson,[8] Martin Hägglund,[9] Mark R Hutchinson,[10] Christa Janse van Rensburg,[2] Karim M Khan,[11] Romain Meeusen,[12] John W Orchard,[13] Babette M Pluim,[14,15] Martin Raftery,[16] Richard Budgett,[1] Lars Engebretsen[1,4,17]

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bjsports-2016-096581).

For numbered affiliations see end of article.

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Accepted 5 July 2016

ABSTRACT
Athletes participating in elite sports are exposed to high training loads and increasingly saturated competition calendars. Emerging evidence indicates that poor load management is a major risk factor for injury. The International Olympic Committee convened an expert group to review the scientific evidence for the relationship of load (defined broadly to include rapid changes in training and competition load, competition calendar congestion, psychological load and travel) and health outcomes in sport. We summarise the results linking load to risk of injury in athletes, and provide athletes, coaches and support staff with practical guidelines to manage load in sport. This consensus statement includes guidelines for (1) prescription of training and competition load, as well as for (2) monitoring of training, competition and psychological load, athlete well-being and injury. In the process, we identified research priorities.

combined with the increasingly saturated competition calendar may damage the health of athletes.[7–9] It was suggested nearly three decades ago that the balance between external load and tissue capacity plays a significant causative role in injury.[10 11] Although injury aetiology in sports is multifactorial and involves extrinsic and intrinsic risk factors,[12 13] evidence has emerged that load management is a major risk factor for injury.[14] Insufficient respect of the balance between loading and recovery can lead to prolonged fatigue and abnormal training responses (maladaptation),[15–18] and an increased risk of injury and illness (figure 2).[14 19]

We consider the relationship between load and health as a well-being continuum,[16] with load and recovery as mutual counteragents (figure 3). Sport and non-sport loads impose stress on athletes, shifting their physical and psychological well-being along a continuum that progresses from homeostasis through the stages of acute fatigue, functional

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provides athletes, coaches and support staff with practical guidelines for appropriate load management to reduce the risk of illness and overtraining in sport. These include guidelines for prescription of training and competition load, as well as for monitoring of training, competition and psychological load, athlete well-being and illness. In the process, urgent research priorities were identified.

Consensus statement

s too much? (Part 2) l Olympic Committee consensus n load in sport and risk of illness

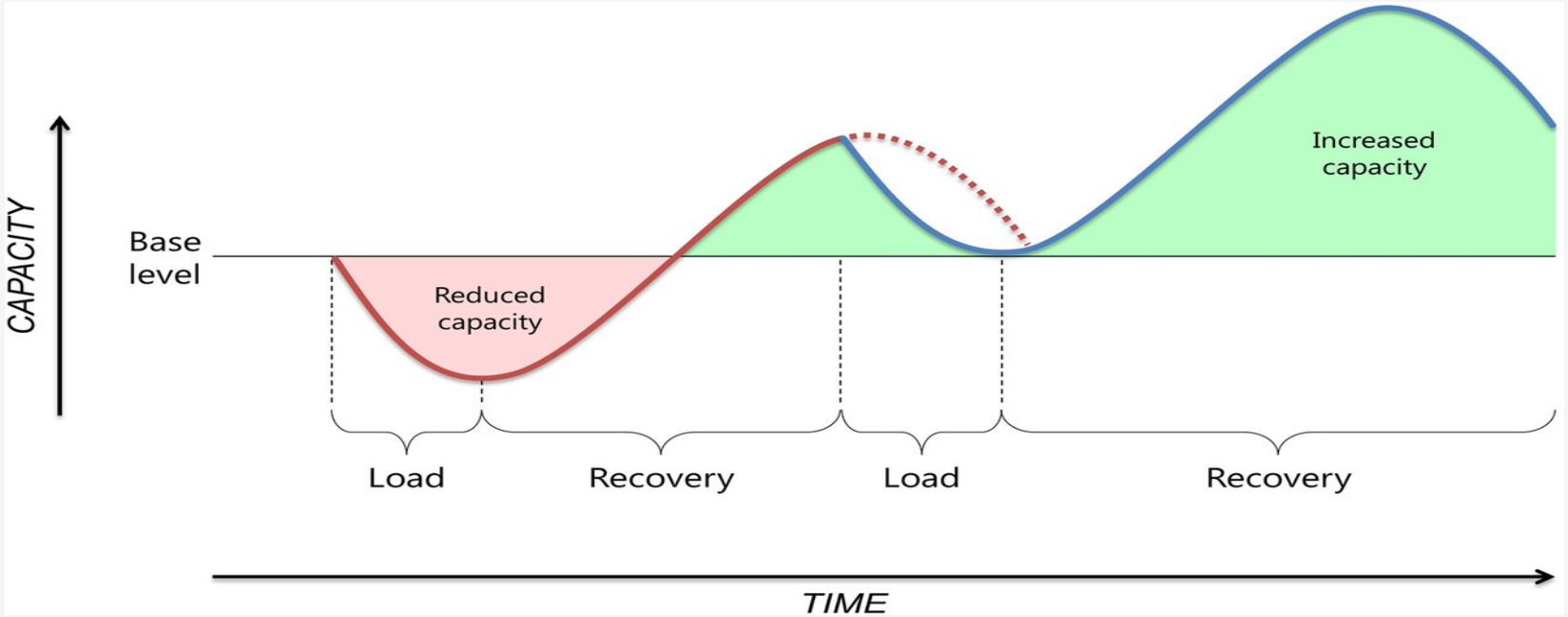
Torbjørn Soligard,[2] Juan-Manuel Alonso,[3] Roald Bahr,[3,4,5] aul Dijkstra,[3] Tim J Gabbett,[6] Michael Gleeson,[7] Mark R Hutchinson,[9] Christa Janse Van Rensburg,[1] John W Orchard,[11] Babette M Pluim,[12,13] Martin Raftery,[14] ars Engebretsen[2,4,15]

rticipating in elite sports is ads and increasingly saturated ging evidence indicates that ment is a significant risk factor ertraining syndrome. The IOC o review the scientific evidence —including rapid changes in ad, competition calendar oad and travel—and health er summarises the results linking vertraining in athletes, and

studied in a variety of settings including the Summer[5] and Winter Olympic Games,[6 7] Winter Youth Olympic Games,[8] Summer Paralympic Games,[9] Winter Paralympic Games[10] and other international competitions in a variety of sports including athletics,[11] aquatic sports,[12] football[13 14] and rugby union (table 1).[15]

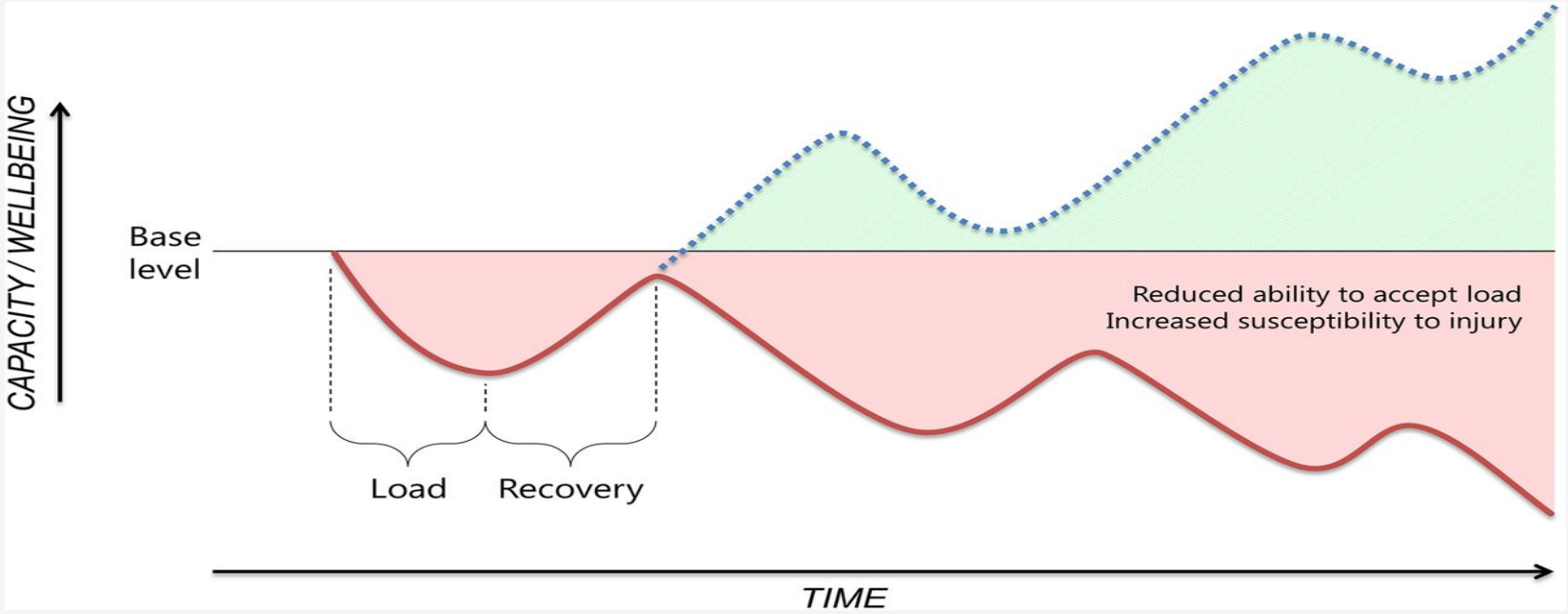
These data indicate that in shorter duration (<4 weeks) major international games and tournaments, 6–17% of registered athletes are likely to suffer an illness episode, with an apparently higher incidence proportion (IP—defined as the % athletes presenting with an illness during the games), of tournament or competition illness in female athletes compared with male athletes. Furthermore, the IP of illness appears to be higher in Winter[6] compared with Summer Olympic Games[5] and data from one study indicate that athletes with disability participating in the Paralympic Games[9] appear to have a higher IP of illness than athletes competing in the Olympic Games.[5] Finally, the data from one study indicate that

Biological adaptation through cycles of loading and recovery (adapted from Meeusen6).



Torbjørn Soligard et al. Br J Sports Med 2016;50:1030-1041

Biological maladaptation through cycles of excessive loading and/or inadequate recovery (adapted from Meeusen6).



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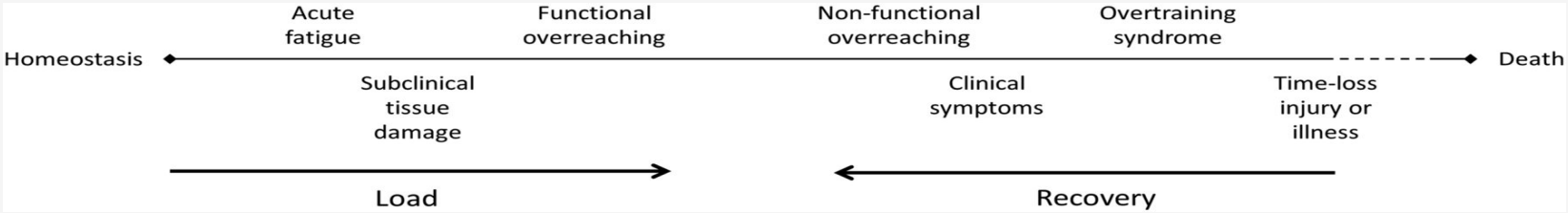
load – regeneration are against players



Well-being continuum (adapted from Fry et al16).

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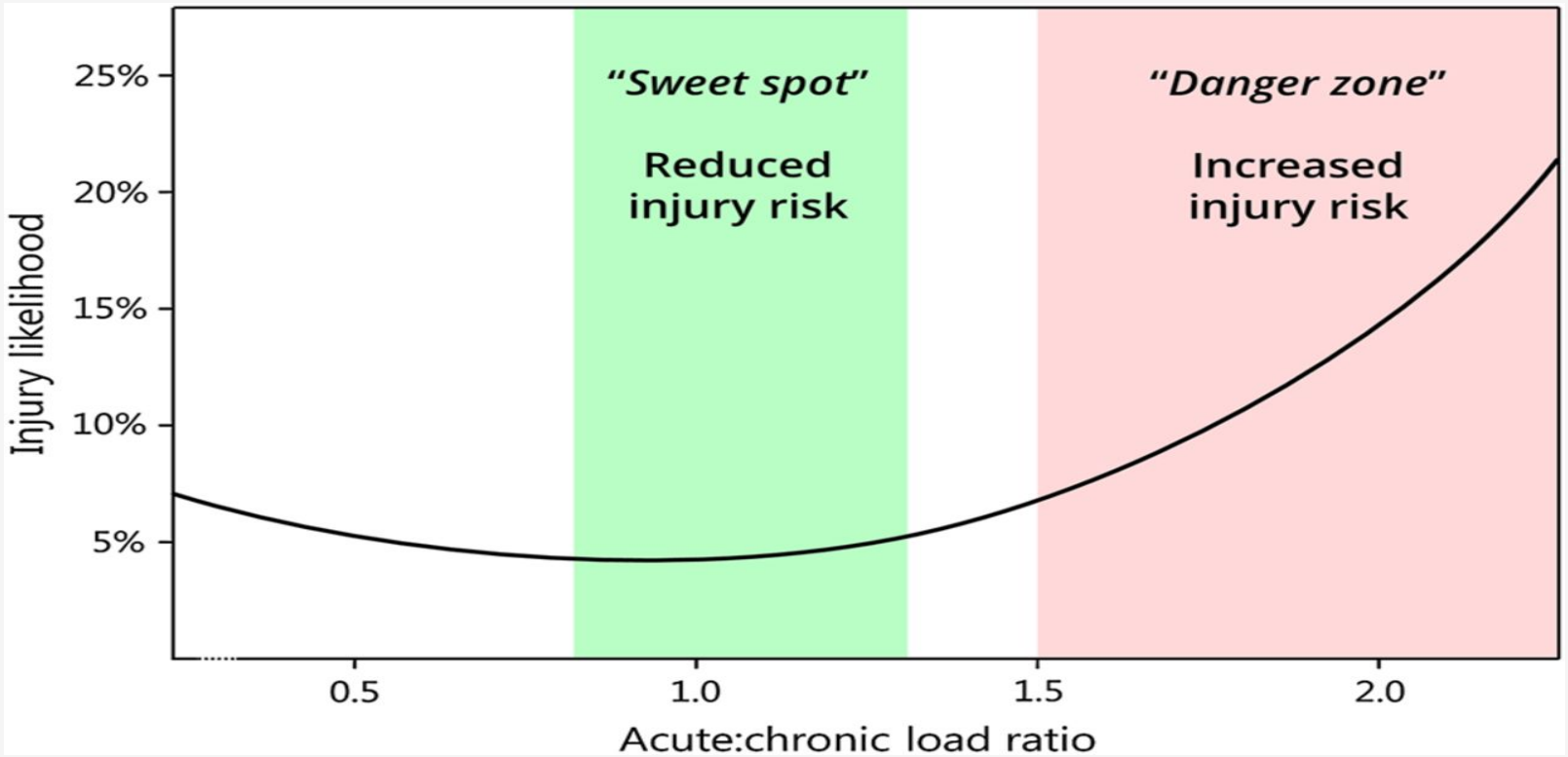
BJSM

Acute:chronic load ratio (redrawn from Gabbett45).



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Acute vs. chronic workload

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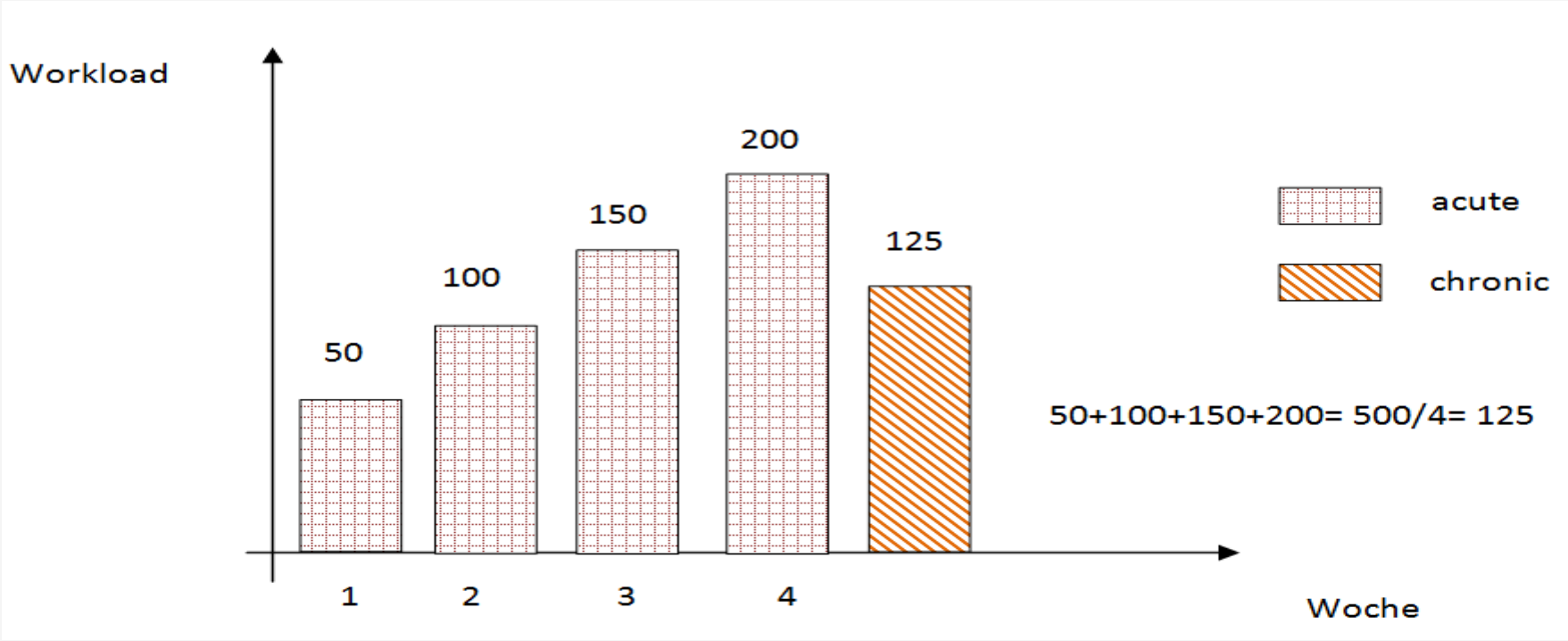

chronic workload is more than 150% - injury risk increases!

Mind the gap

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Table 1 Examples of measurement tools to monitor external and internal load

Load type	Examples of measurements
External load	Training or competition time (seconds, minutes, hours or days)[36]
	Training or competition frequency (eg, sessions or competitions per day, week, month)[37]
	Type of training or competition[38]
	Time-motion analysis (eg, global positioning system analysis)[39]
	Power output, speed, acceleration[40]
	Neuromuscular function (eg, jump test, isokinetic dynamometry and plyometric push-up)[41]
	Movement repetition counts (eg, pitches, throws, bowls, serves and jumps)[42 43]
	Distance (eg, kilometres run, cycled or swam)[44]
	Acute:chronic load ratio[45]
Internal load	Perception of effort (eg, rating of perceived exertion and RPE)[46]
	Session rating of perceived effort (eg, session duration (min)×RPE)[28]
	Psychological inventories (eg, profile of mood states (POMS),[47] recovery-stress questionnaire for athletes (REST-Q-Sport),[48] daily analysis of life demands for athletes (DALDA),[49] total recovery scale (TQR),[17] life events survey for collegiate athletes (LESCA),[50] multicomponent training distress scale (MTDS),[51] the hassle and uplift scale,[52] brief COPE,[53] the Swedish universities scales of personality (SSP),[54] state trait anxiety inventory (STAI),[55] sport anxiety scale (SAS),[56] athletic coping skills inventory-28 (ACSI-28),[57] body consciousness scale,[58] perceived motivational climate in sport questionnaire (PMCSQ)[59] and commitment to exercise scale (CtES))[60]
	Sleep (eg, sleep quality and sleep duration)[61]
	Biochemical/hormonal/immunological assessments[18 26]
	Psychomotor speed[62]
	HR[63]
	HR to RPE ratio[64]
	HR recovery (HRR)[65]
	HR variability (HRV)[66]
	Training impulse (TRIMP)[67]
	Blood lactate concentrations[68]
	Blood lactate to RPE ratio[69]

HR, heart rate; RPE, ratings of perceived exertion.

A successfull strategy seems to be...

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