



What can we learn from the world of elite sports?

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Getting the balance right -seminar, Helsinki 6.3.2014

www.kihu.fi



Balance between stress and recovery?

- Overreaching, overtraining, overtraining state, overtraining syndrome, under-recovery, staleness

| PROCESS | TRAINING (overload) | INTENSIFIED TRAINING → | | |
|-------------|------------------------|--|--------------------------------|-----------------------------------|
| | | FUNCTIONAL OR (short-term OR) | NON-FUNCTIONAL (extreme OR) | OVERTRAINING (OTS) |
| OUTCOME | ACUTE FATIGUE | FUNCTIONAL OR (short-term OR) | NON-FUNCTIONAL (extreme OR) | OVERTRAINING SYNDROME (OTS) |
| RECOVERY | Day(s) | Days – weeks | Weeks – months | Months - ... |
| PERFORMANCE | INCREASE | Temporary performance decrement (e.g. training camp) | STAGNATION DECREASE | DECREASE |

Meeusen et al. 2006 Prevention, diagnosis and treatment of the Overtraining Syndrome, EJSS 6(1): 1-14.



Longitudinal studies

- Hard training period of three weeks in endurance runners followed by a relative rest week
- Athletes were training according to the plan of their coach and nocturnal HRV was analyzed twice a week



Hard training and nocturnal HRV

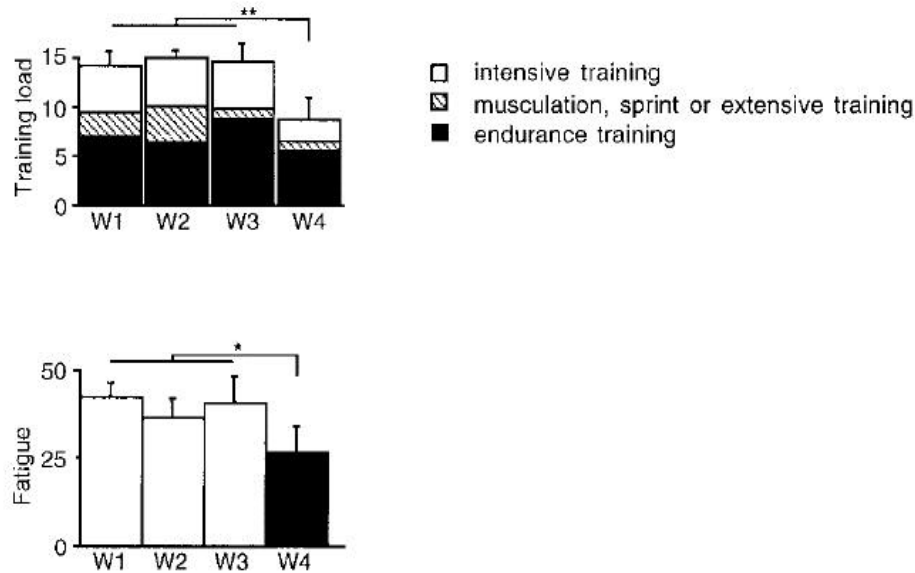


Figure 1—Training load quantification of different types of trainings (upper part) and fatigue sensation indices of the athletes (lower part), plotted against the 4-wk training cycle. The three first bars (W1, W2, and W3) represent the results obtained during the first 3 wk of heavy training period; the last bar (W4) represents the results obtained during the relative resting period.

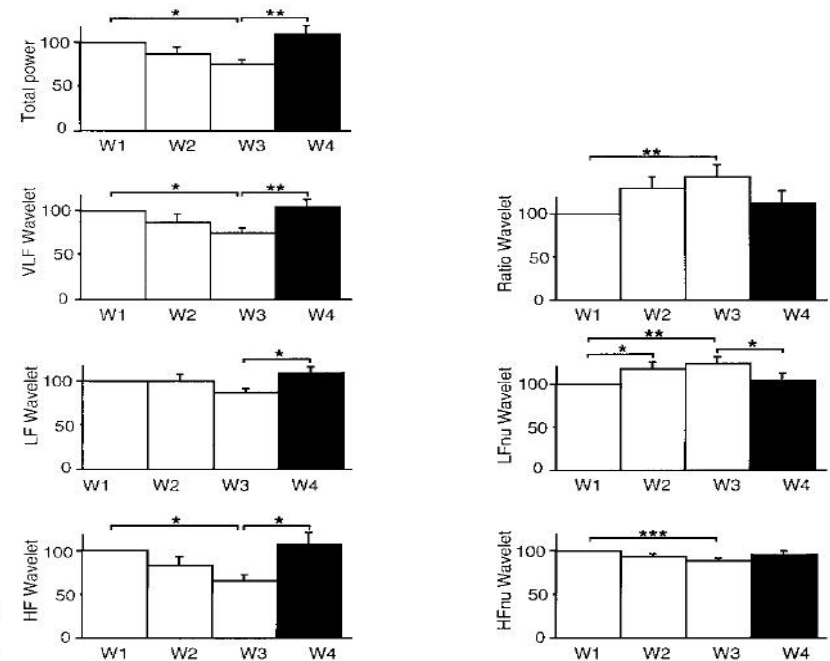
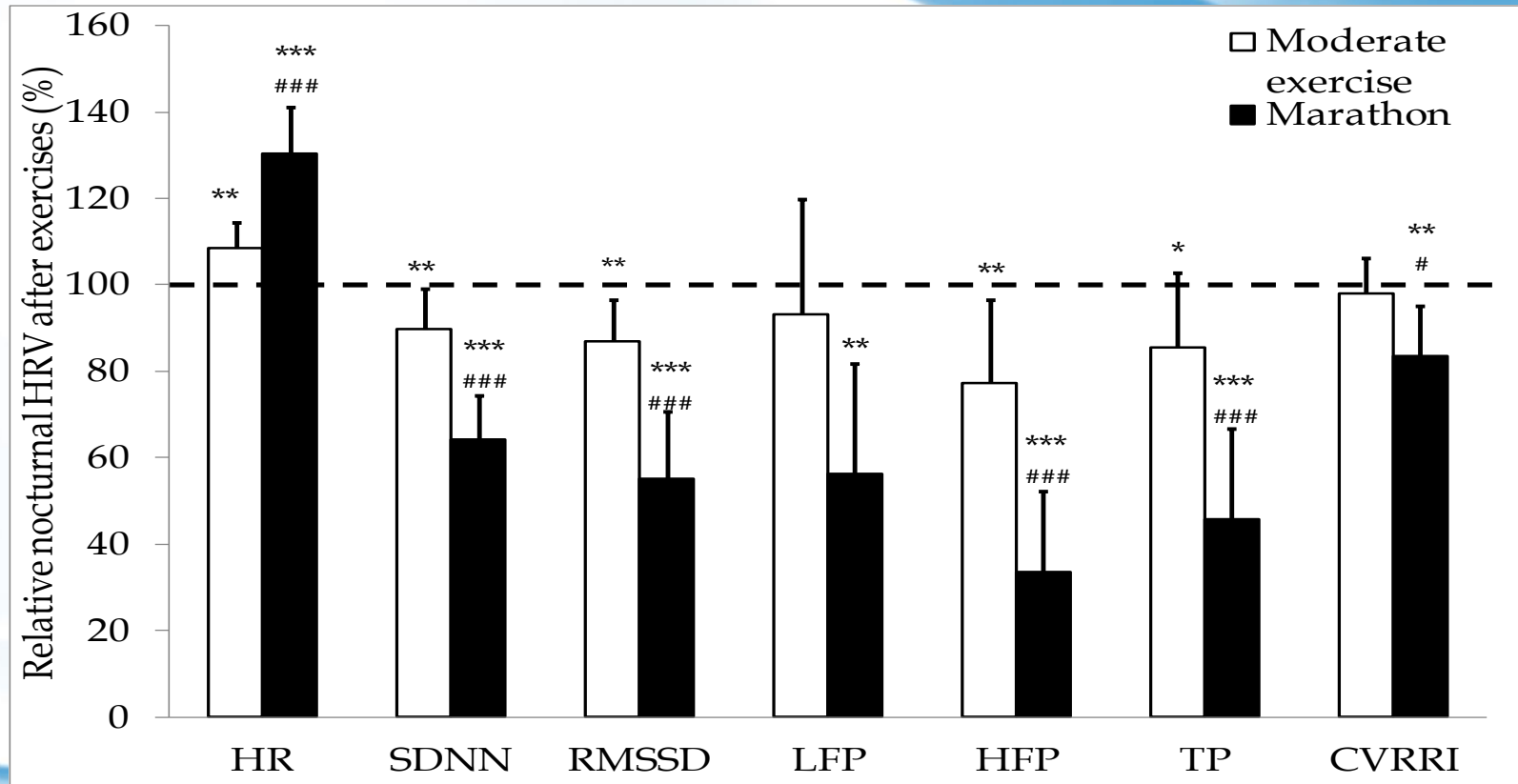


Figure 3—Relative indices of Wavelet analysis of heart rate variability on the night periods during the 4-wk training cycle. The three first white bars (W1, W2, and W3) represent the results obtained during the first 3 wk of heavy training period; the black bar (W4) represents the results obtained during the relative resting period. Week 1 has been taken as the 100% reference value for each subject and each variable.



Acute physical stress and nocturnal HRV





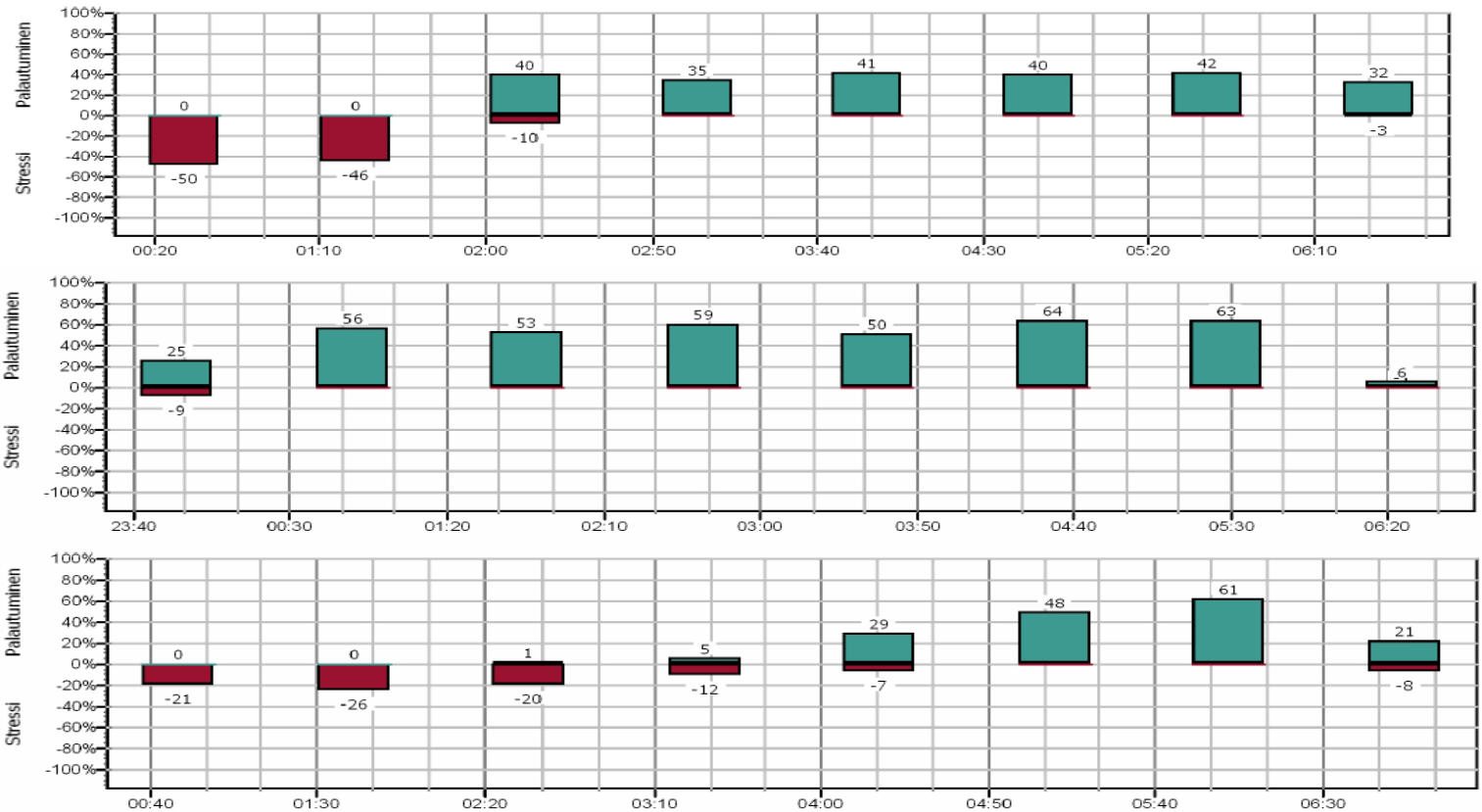
Experiences from elite athletes

- Starting from “Project Torino 2006”: collaboration with Finnish cross-country skiers
- Different measurements; lot's of HR measurements
- Ending up using nocturnal HRV as a measure of the recovery
 - Night rest is the most important period for recovery
 - Especially the few first hours are related to recovery



Recovery (resources)

Stressin ja palautumisen osuudet jaksottain



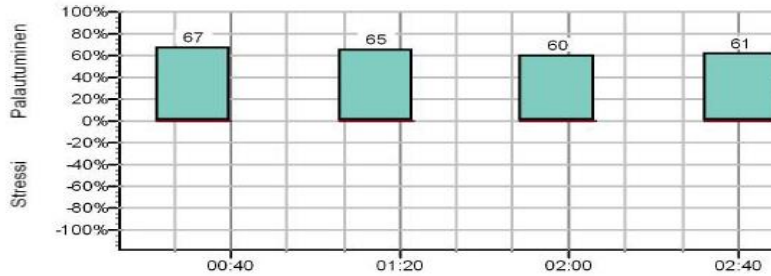
Stressiä ja palautumista kuvaavien reaktioiden voimakkuus mittaussjakson eri aikoina. Koko mittaussjakso on jaettu kahdeksaan osaan. Prosenttiosuudet pylväiden kohdalla kuvaavat näiden reaktioiden osuutta kullakin jaksolla.



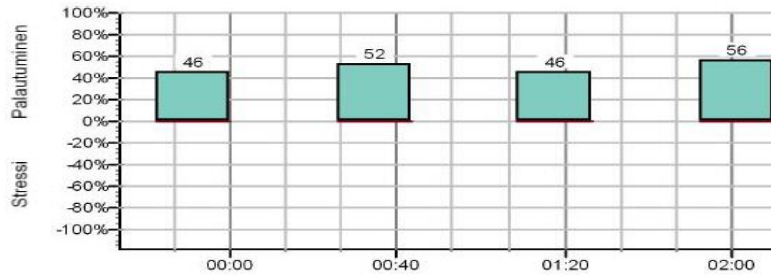
“Green man” ... (from Mars?)

Stressin ja palautumisen osuudet jaksoittain

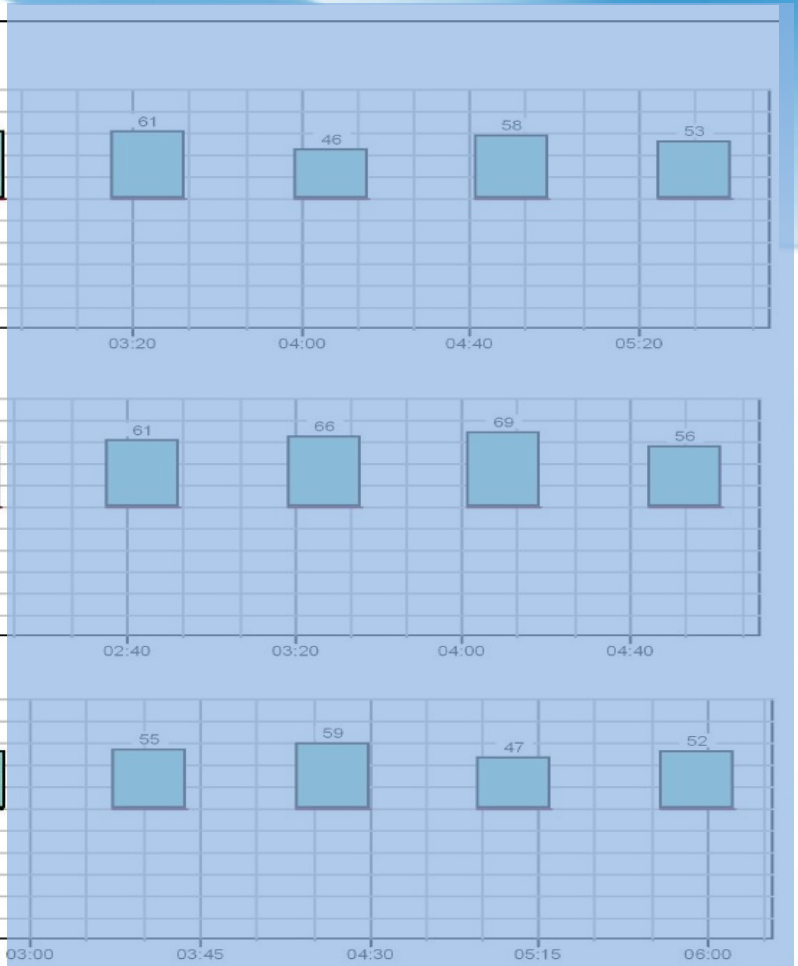
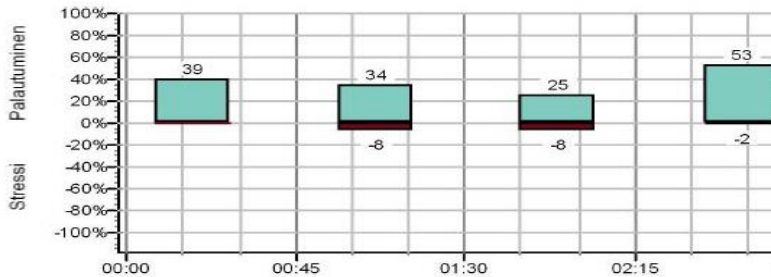
Good recovery
state



Fairly good



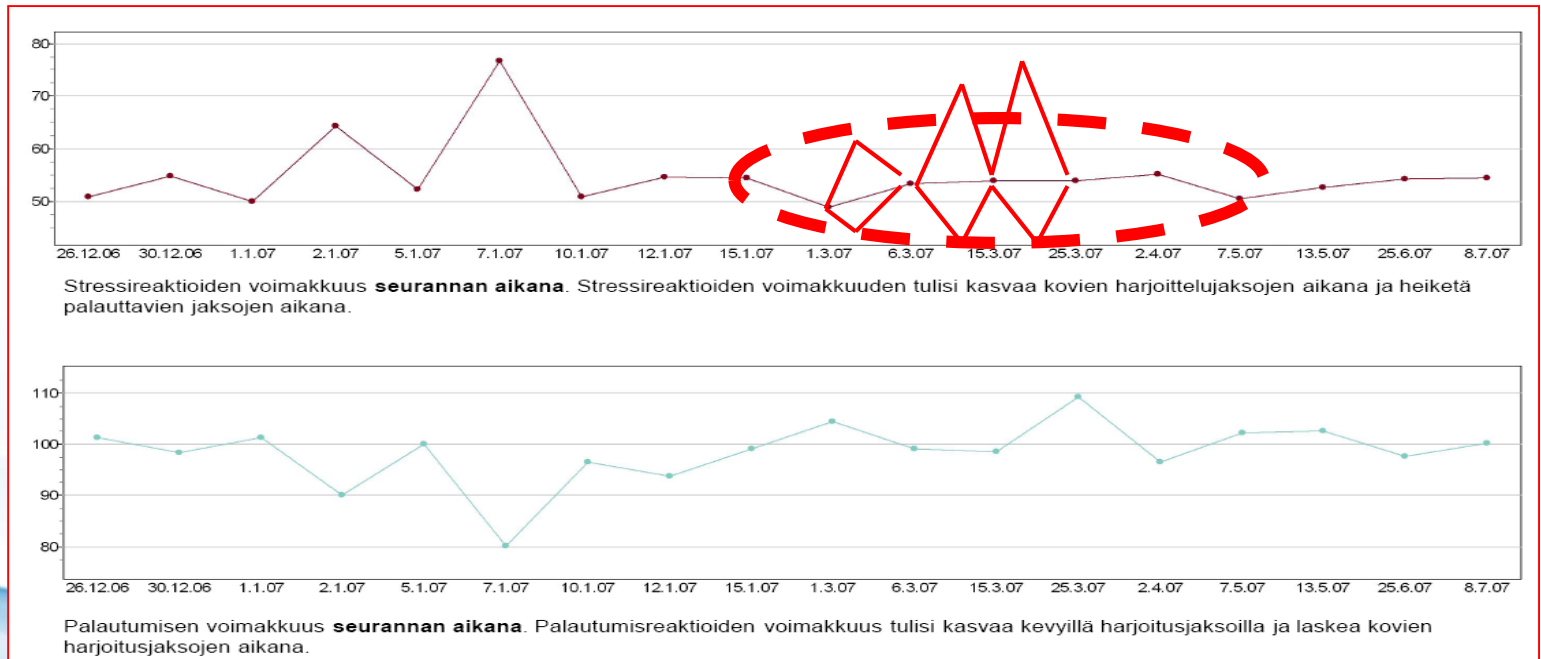
Overreach





The frequency of HRV analysis

- More frequently or just occasionally?

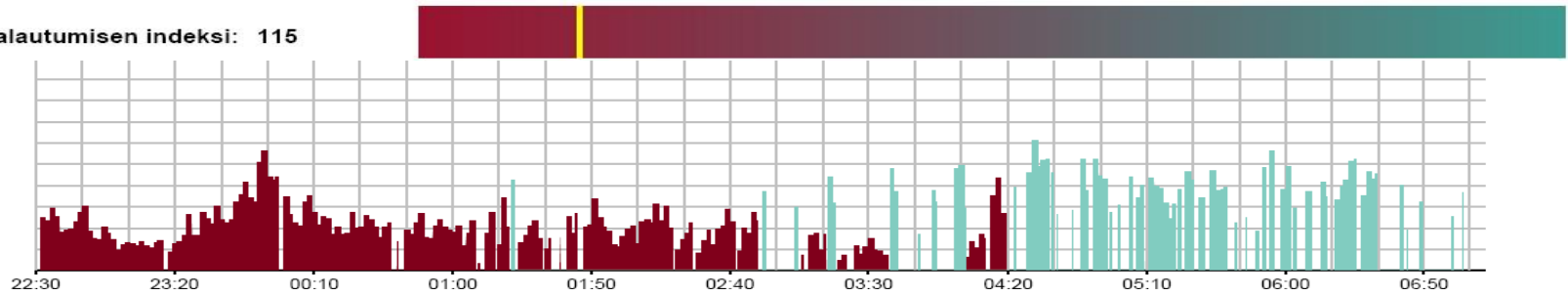




Analysis of the recovery

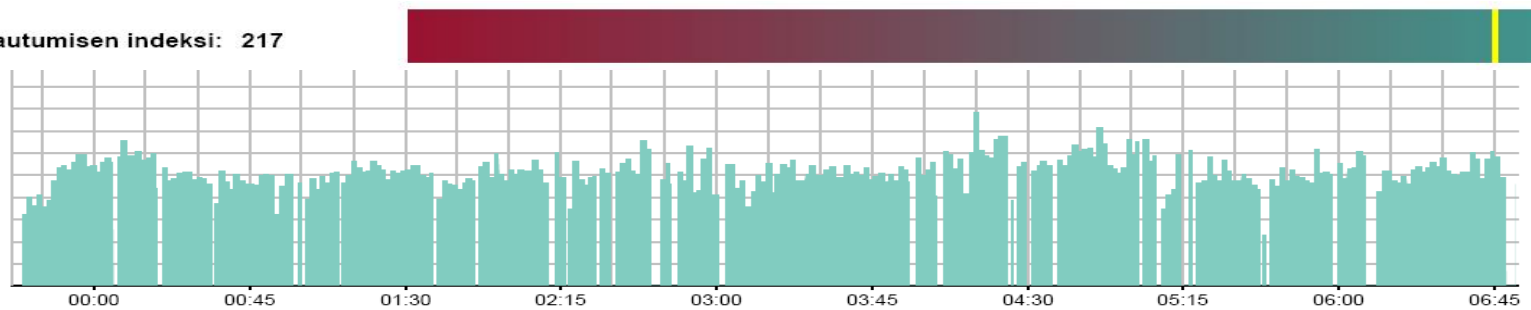


Palautumisen indeksi: 115



| | Kesto | Osuus |
|-----------------|----------|-------|
| Stressireaktiot | 3h 34min | 95 % |
| Palautuminen | 4 min | 2 % |

Palautumisen indeksi: 217



| | Kesto | Osuus |
|-----------------|----------|-------|
| Stressireaktiot | 0 min | 0 % |
| Palautuminen | 3h 21min | 96 % |



To Osaka (World Championships 2007)

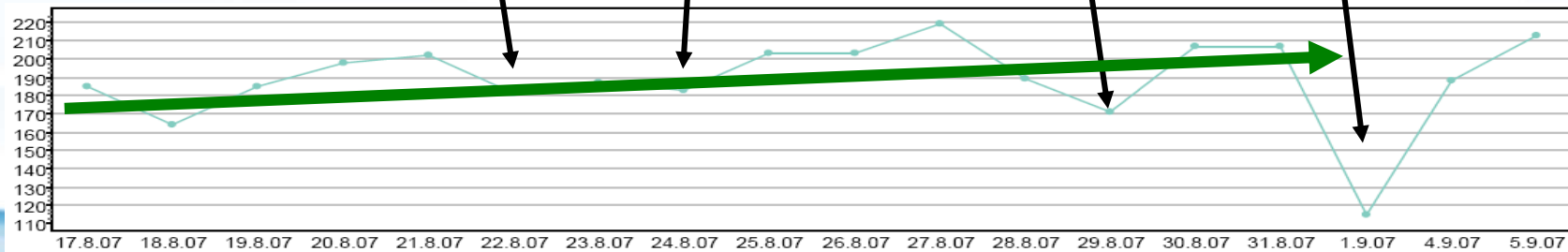
Adaptation

8 x 1k fast

Hard 25k

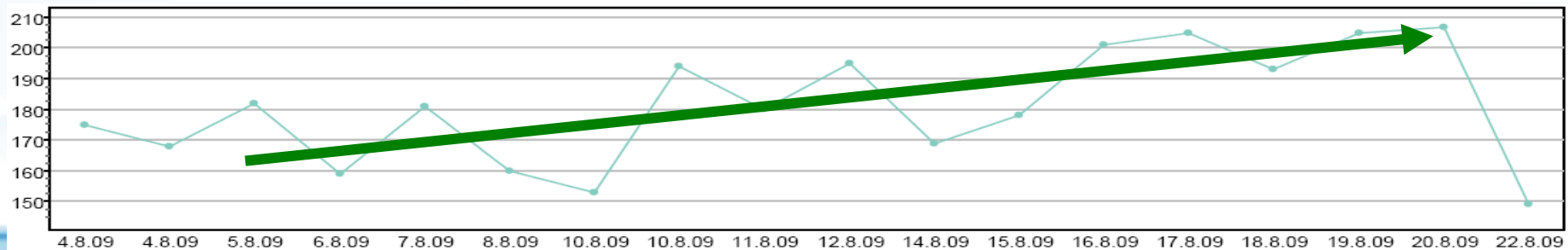
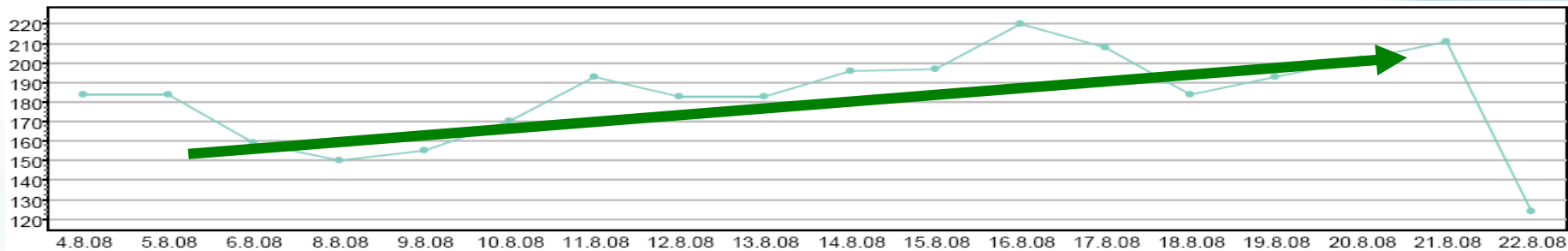
8 x 400m
fast

WC-50k



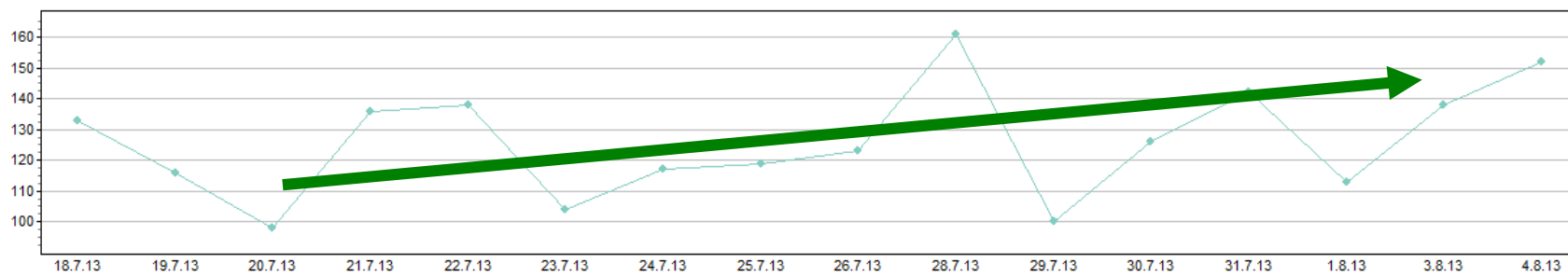


To Beijing (-08) and Berlin (-09)



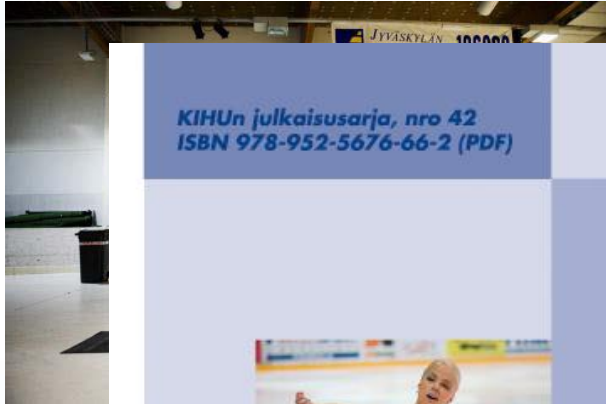


To Moscow (-13)





Follow-up of figure skaters



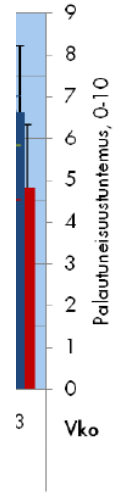
KIHUn julkaisusarja, nro 42
ISBN 978-952-5676-66-2 (PDF)



Ville Vesterinen, Esa Hynynen, Ari Nummela ja Tommi Sipari

Taitoluisteluharjoittelun kuormittavuuden seuranta

Palautumisen indeksi (% max)



iri; KVK =

Taulukko 1. Lyhyt- ja

Kesto (min:s)

Laktaatti (mmol/l)

Maksimsyke (krt/mi)

Keskisyke (krt/min)

Kuormitustunteus (l)

Onnistuminen (0-10)

Palautuneisuus (0-10)

Esikevennyshyppy e

Esikevennyshyppy j

Muutos (cm)

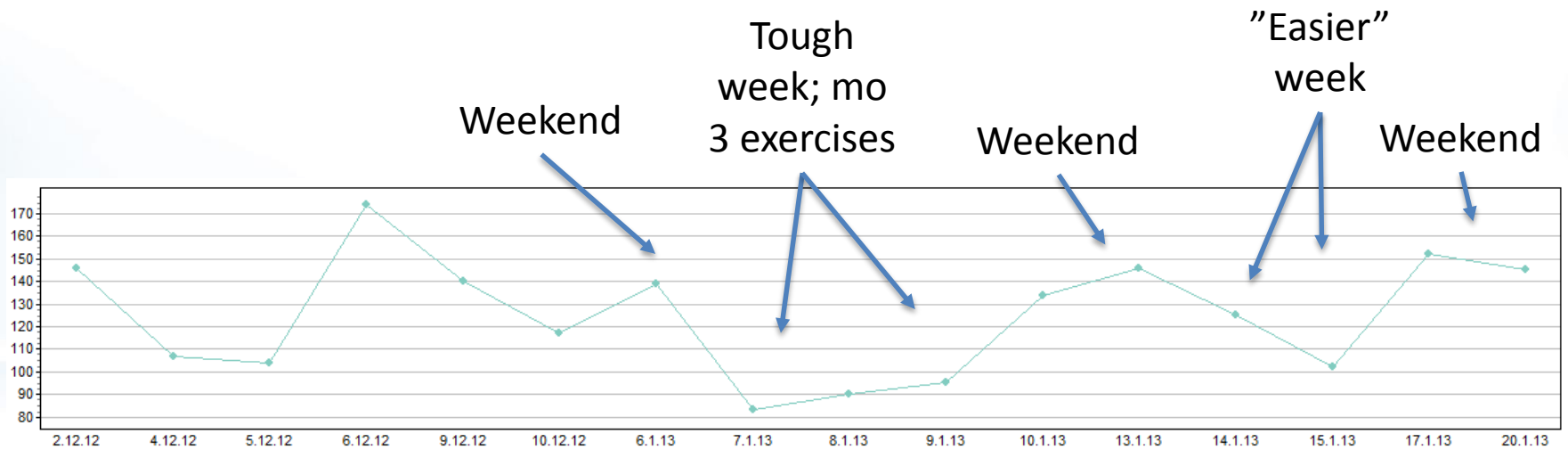
* P < 0,05, ** P < 0,

P < 0,05, tilastollise:



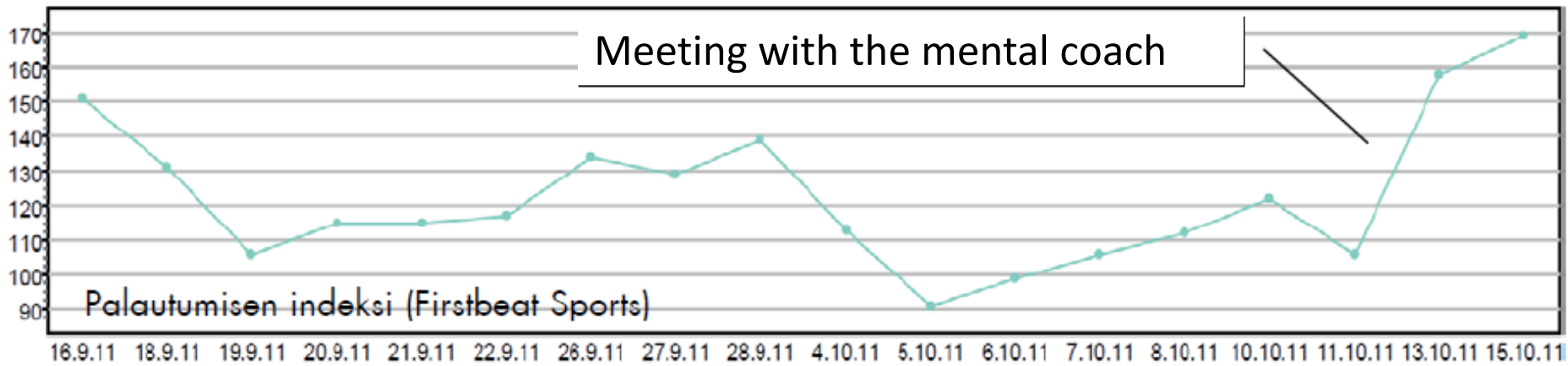


Towards the Euro-champs (25.-26.1.2013)





Psychophysiology

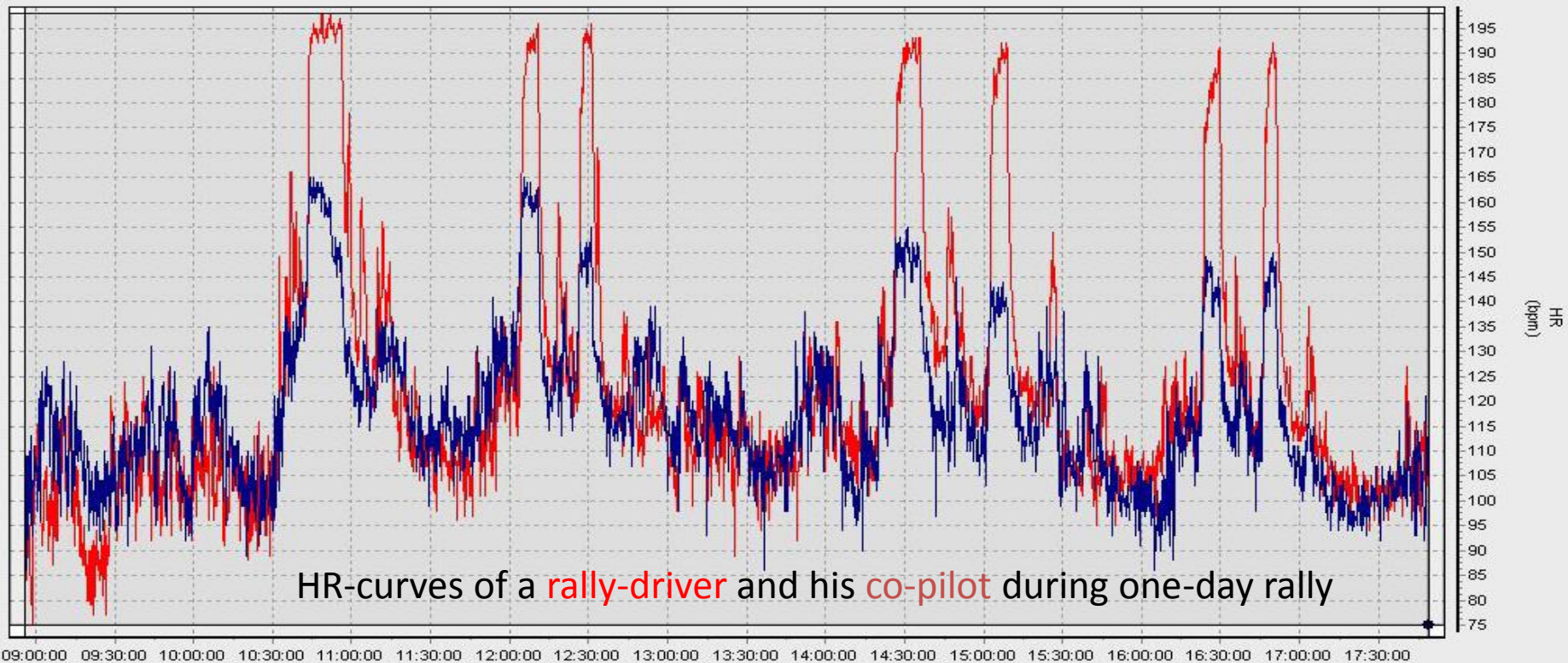


*Kuvio 17. Esimerkkiluistelijan palautumisen indeksissä tapahtuva muutos psyykkisen stressiteki-
jän helpottaessa.*

An example of getting rid of the mental stress



Motorsports and cardiac activity





Nocturnal HRV of a rally-driver during Neste-oil rally

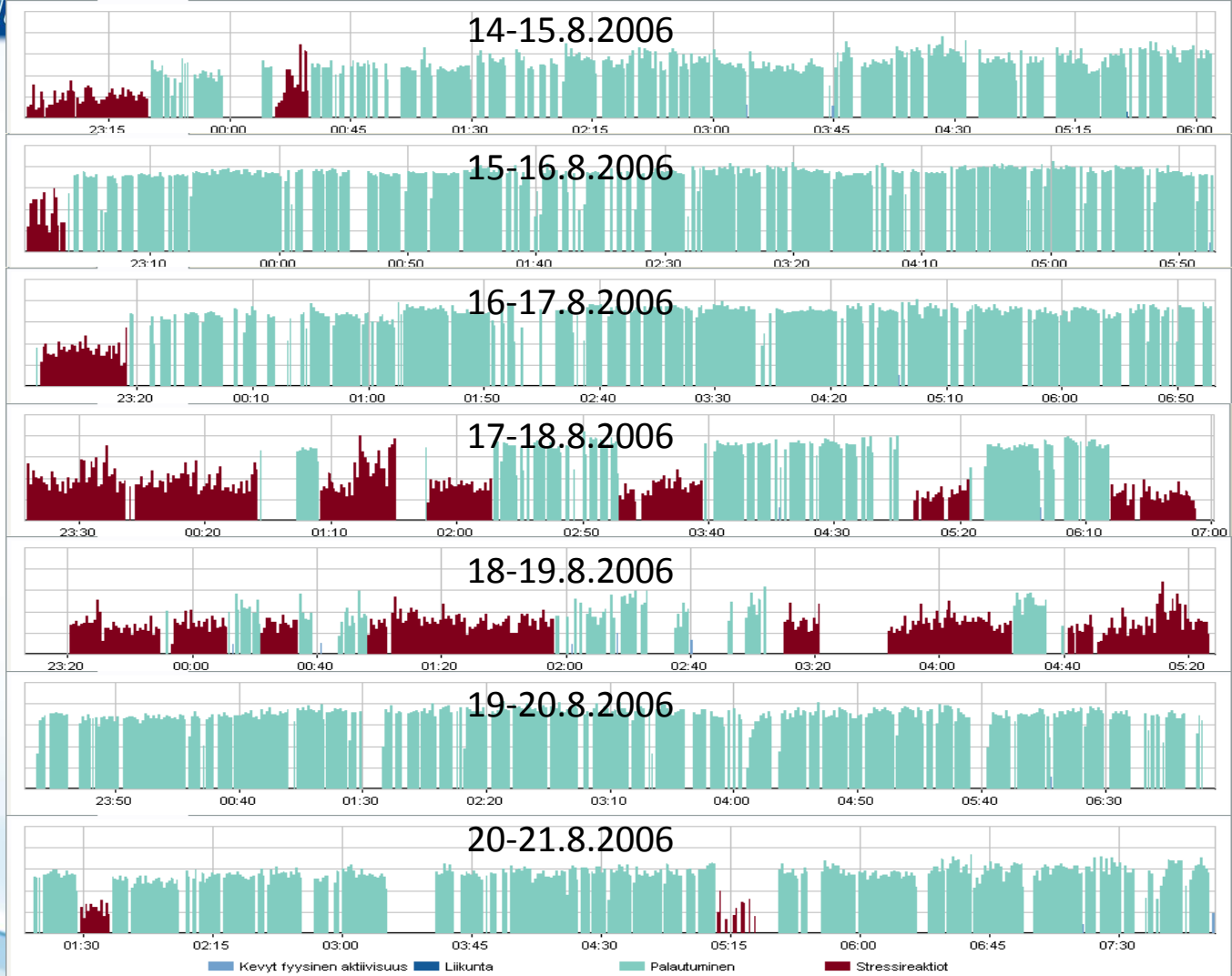
Practicing & making the "notes"

SS 1

SS 2-9

SS 10-12; hitting a rock

SS 18-21





Example of effects of asthma medication

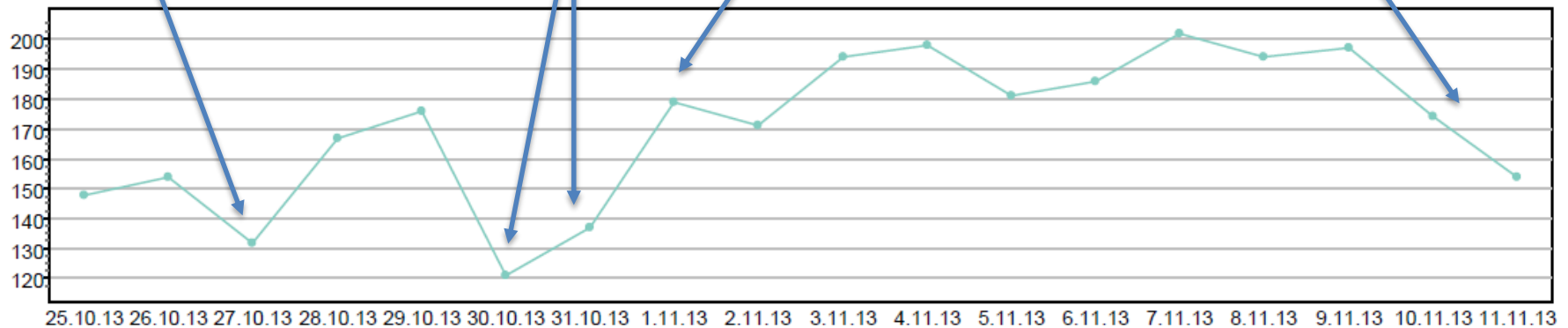
Hard training session in the afternoon

Easier days

Symbicort also in the evening

Back home

Hard training sessions / competition



Altitude training camp

Back home, easier training

Is this only a matter of interpreting the results with the knowledge of effects of medication on HRV or is the recovery truly compromised with increased dosage of medication?



Control the stress!

- Positive stress may help to perform well
- If prolonged it may become overwhelming
- Some times the best thing to do is to avoid the stress...



*You are tight as a string
of a violin, Hägar. You
have to avoid the stress!*

*I'll try to do my
very best!*

*What did the
doctor say?*

*Your mother can't
visit us anymore...*



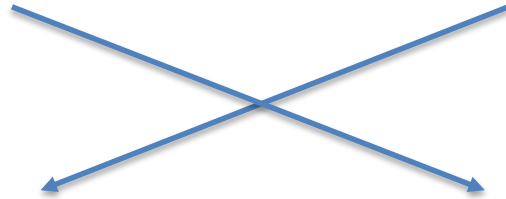
Take home message:

- Physical exercise / training disturbs the well-being of the body and mind
 - Intensity, volume, etc. makes a difference
- Increased fitness => reduced disturbance
- Systematic follow-up is better than occasional measurements
- Learning new methods (and new subjects) takes some time
- Be careful with the data to be analyzed!



Too much of a good thing...

STRESSED



DESSERTS



That's all, folks!

Questions?

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