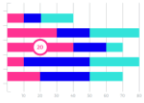


HRV monitoring, tool or toy? Insight from the elite world



Martin Buchheit, PhD



FIRSTBEAT HRV SUMMIT
Elements of optimal performance
May 13-14, 2019, Helsinki



1

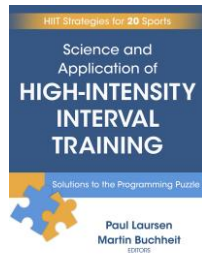
A 20-years relationship with HRV



2



Book and Online Course
@HIITscience



3

5 PhDs...

Hani Al Haddad, PhD #2
(France & Qatar)



Qatar Federation

Jamie Stanley, PhD #3
(Australia)



Australian Cycling

Dan Plews, PhD #4
(New Zealand)

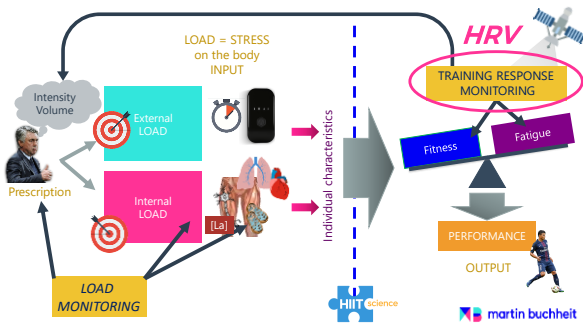


Tri World Champ

Robon Thorpe, PhD #5
(UK)
Manchester United



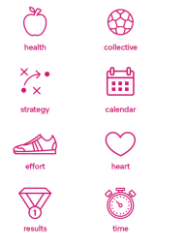
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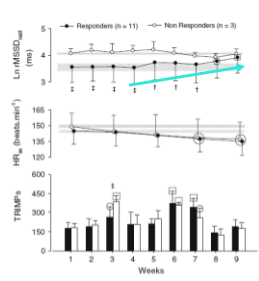
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Overview

1. Responses to training
2. HRV-guided training
3. Practical considerations



6



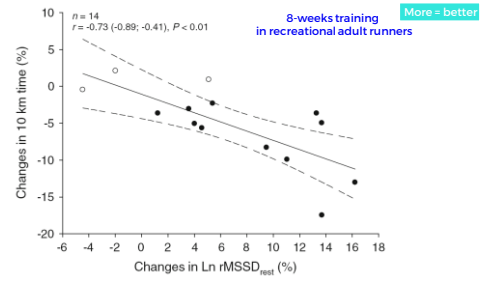
More - better
8-weeks training
 5-min run every second week
 + daily HRV
 Recreational adult runners



Buchheit et al. EJAP 2010b

martin buchheit

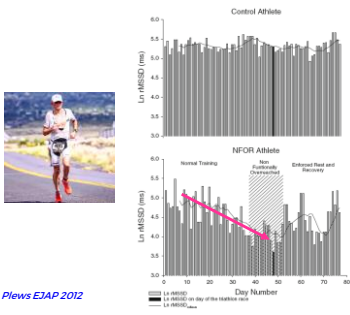
7



Buchheit et al. EJAP 2010b

martin buchheit

8



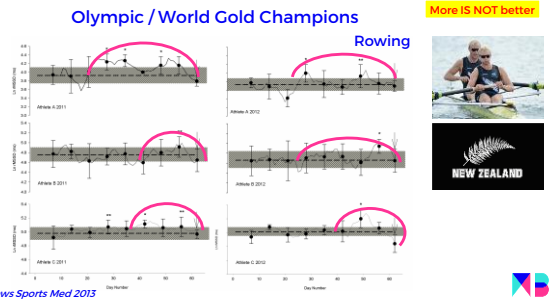
Plews EJAP 2012

Less - worse

Elite Triathletes (NZ Champions)



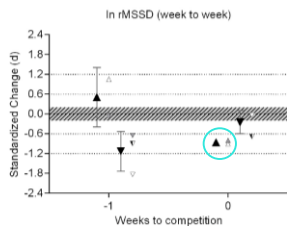
9



Plews Sports Med 2013



10



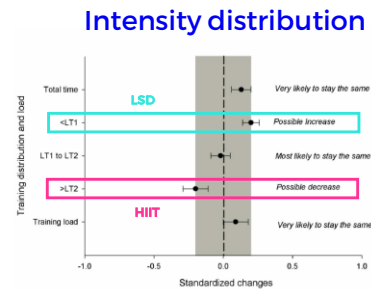
Stanley JSPP 2015



More IS NOT better

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11



Plews 2014

IT DEPENDS!!!!



12

Vagal tone vs. modulation

Acta Physiol Scand 1995, 155, 267-273

The high frequency component of heart rate variability reflects cardiac parasympathetic modulation rather than parasympathetic 'tone'

A. E. HEDMAN,¹ J. E. K. HARTIKAINEN,² K. U. O. TAHVANAINEN³ and M. O. K. JARAKMAKI¹

¹Department of Physiology and ²Department of Medicine, University of Kuopio, ³Department of Clinical Physiology and Clinical Neurophysiology, Tampere University Hospital, Finland

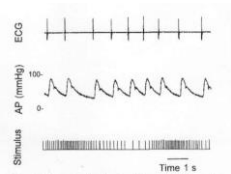


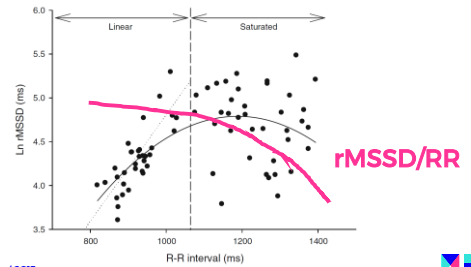
Fig. 1. An example of recording of ECG, aortic pressure (AP) and stimulus pulses during stimulation of the vagus nerve with a pattern simulating respiratory modulation of heart rate at the frequency of 0.2 Hz. The instantaneous stimulation frequency varied between 2.5 and 25 Hz during 5 s period.

Hedman Act Physiol Scand 1995

martin buchheit

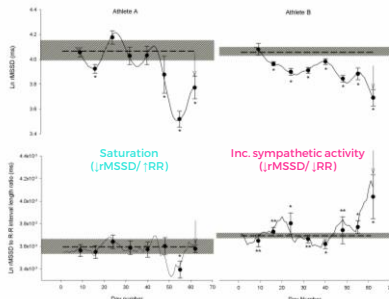
13

Saturation?



Plews Sports Med 2013

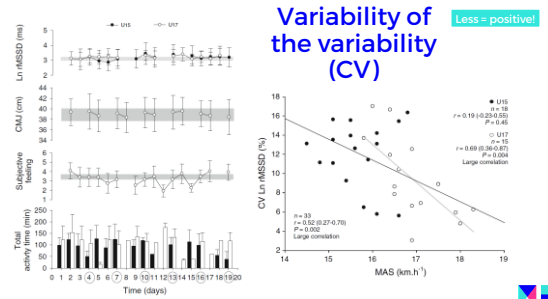
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Plews Sports Med 2013

martin buchheit

15

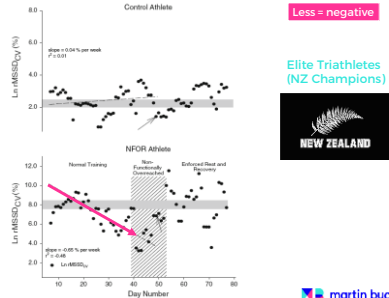


Buchheit EJAP 2010

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16

Variability of the variability (CV)



Plews EJAP 2012

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17

CV...

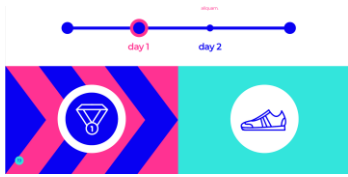
- Buchheit (2010) in elite youth soccer: lower CV = greater fitness
- Plews (2012) in elite triathletes: lower CV = maladaptation
- Flatt (2017) in college swimmers: CV increases = + response
- Flatt (2017) in college women soccer: CV inc. = + response
- Flatt in R7 (2018): low CV → better adaptation !!!!



martin buchheit

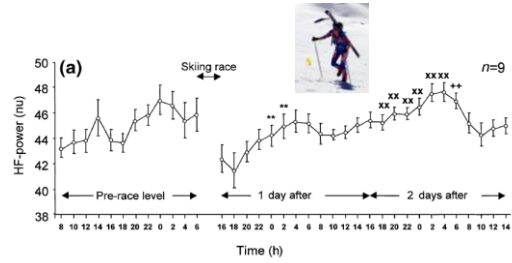
18

2. HRV-guided training



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19



Hautala et al. Clin Physiol 2001



20

Responses to HIIT sessions (rowing)

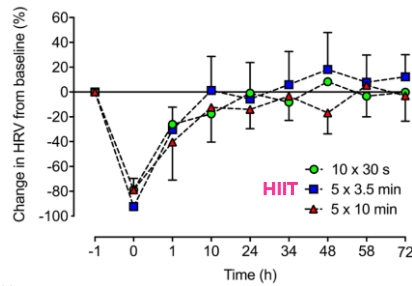
- 5 x 10 min, 4 min rest (threshold session)
- 5 x 3.5 min, 4 min rest (long interval HIIT)
- 10 x 30 s, 5 min rest (sprint interval training)



Holt 2018, HIIT Science



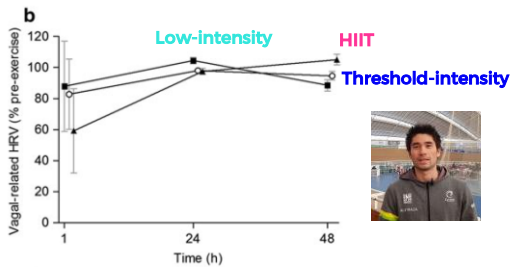
21



Holt 2018, HIIT Science

martin buchheit

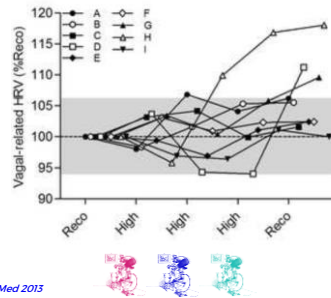
22



Stanley Sports Med 2013

martin buchheit

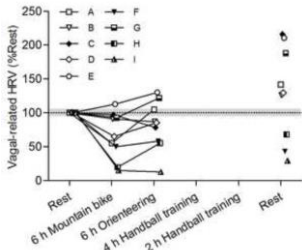
23



Stanley Sports Med 2013



24



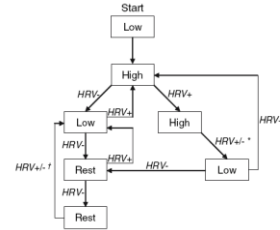
Pro Handball players

Stanley Sports Med 2013

martin buchheit

25

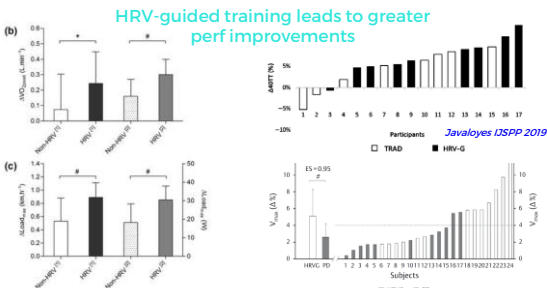
HRV-guided training



Kiviniemi et al. EJAP 2007

martin buchheit

26

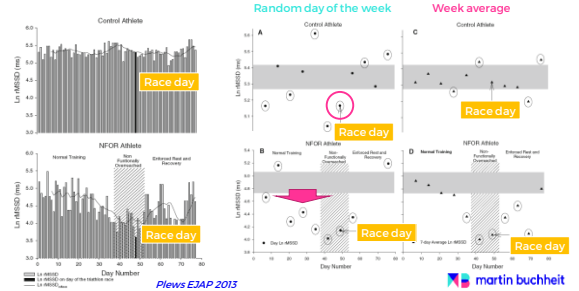


Kiviniemi et al. EJAP 2007
In Stanley Sports Med 2013 MSSE 2009

Nuutila ISM 2017
 martin buchheit

27

Data selection/collection

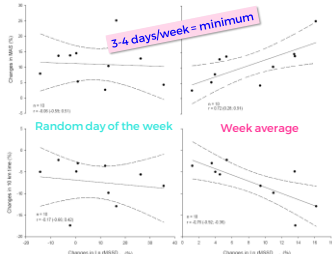


Plews EJAP 2013

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28

Data selection/collection

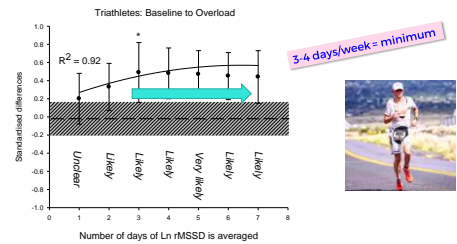


Plews USPP 2014

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29

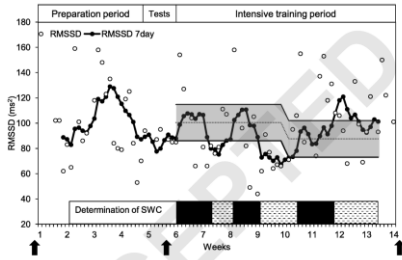
Data selection/collection



Plews USPP 2014

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30



Versterken MSSE 2016



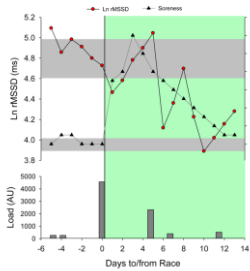
31

3. Practical considerations



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32



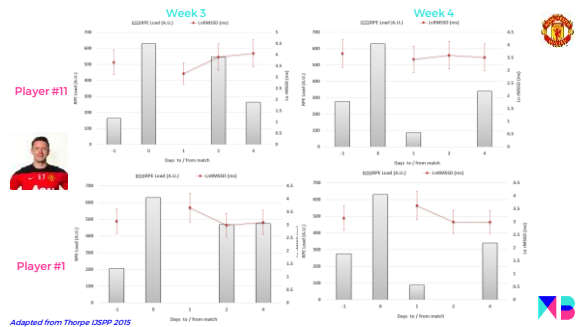
Ultra-Trail 170 km



Buchheit Frontiers 2014

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33

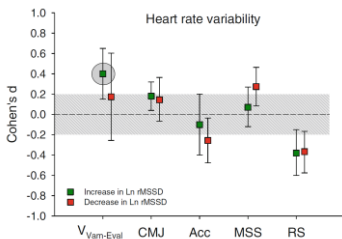


Adapted from Thorpe ISPP 2015



34

HRV sensitivity is performance-specific



3-Month period

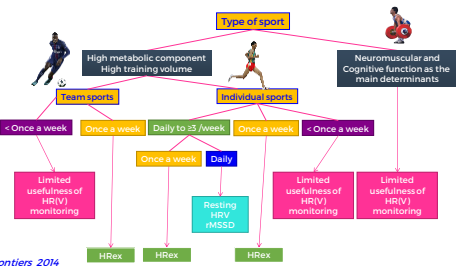


Buchheit EJAP 2012



35

When to use HR measures?



Buchheit Frontiers 2014



36