Monitoring in the professional peloton

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UAE Team Emirates

UAE TEAM Emirates

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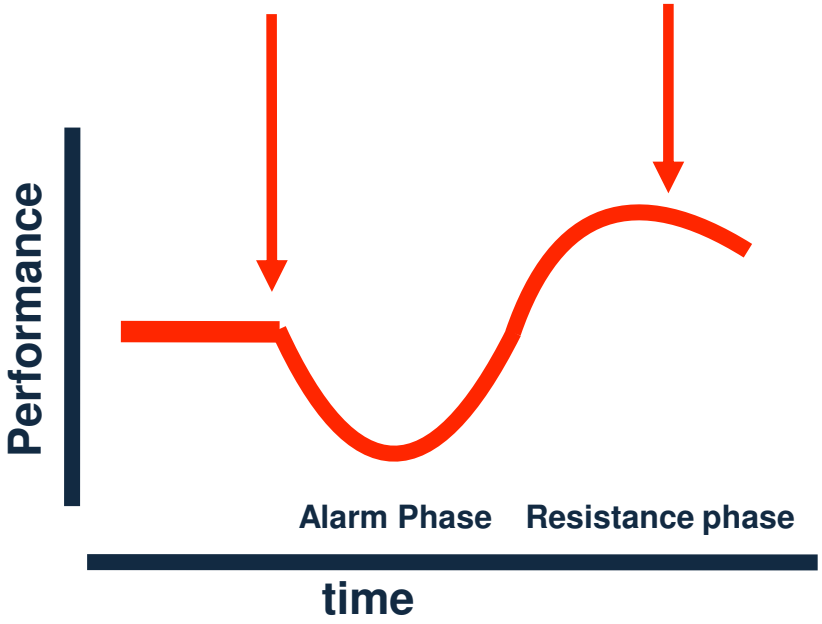
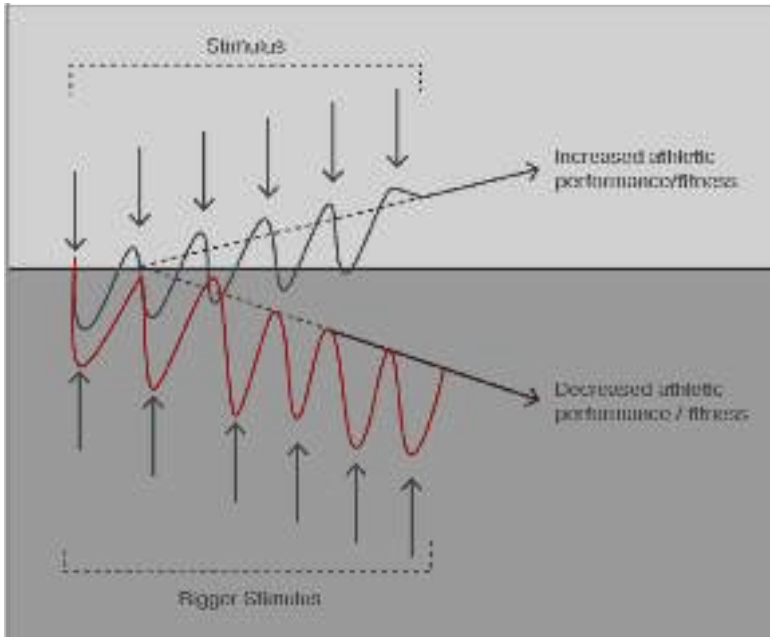
Back To Basics

WHAT IS TRAINING? The act of performing a given athletic task with the goal of creating a stress to your body's homeostasis with the intention to trigger signals to cause positive physiological adaptations





Why monitoring?

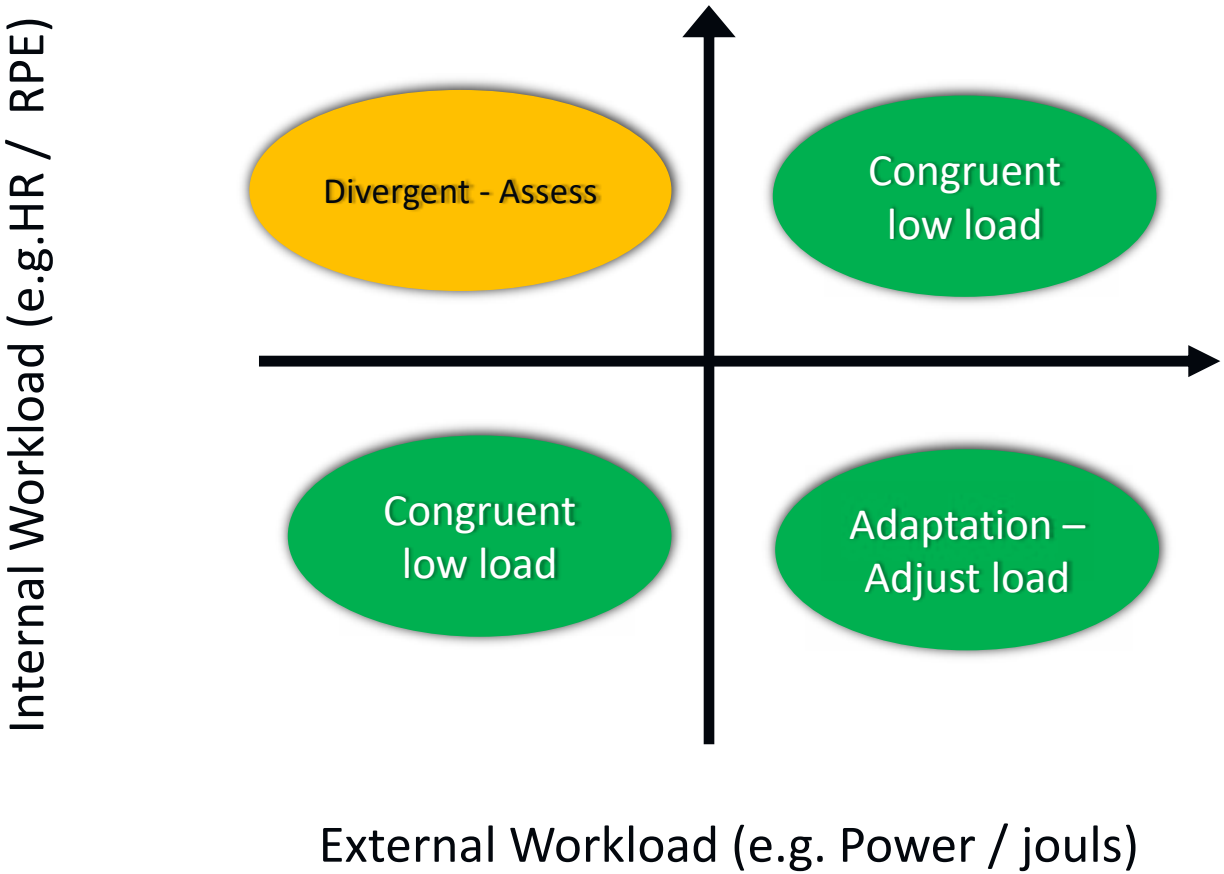
- Optimising training load to enhance recovery, performance & adaptive response to training
- Prevention of non-functional overreaching / overtraining / underperformance
- Injury prevention / Illness prevention
- Assessing training status / performance / team selection criteria

Monitoring

WHAT IS MONITORING? **The synthesis and analysis of either internal or external variables which are either directly or indirectly related or affected by training.**

Internal	External
The relative physiological and psychological stress and athlete incurs from training	The amount of work the athlete performed quantitively
RPE, Heart Rate (&indices), [lactate], biomarkers, wellness scores, sleep	Speed, acceleration, power output, GPS, Neuromuscular function

Congruency


Internal Workload (e.g.HR / RPE)
Divergent - Assess
Congruent low load
Congruent low load
Adaptation – Adjust load
External Workload (e.g. Power / jouls)

Load monitoring

Attributes

- Ease of use & Efficient reporting
- Sensitive, accurate and reliable
- Non aversive
- Should not interfere with training
- Combination of external and internal load units

External Load metrics in cycling

External Load metrics in cycling

A Systems Model of the Effects of Training on Physical Performance

THOMAS W. CALVERT, MEMBER, IEEE, ERIC W. BANISTER, MARGARET V. SAVAGE, AND TIM BACH

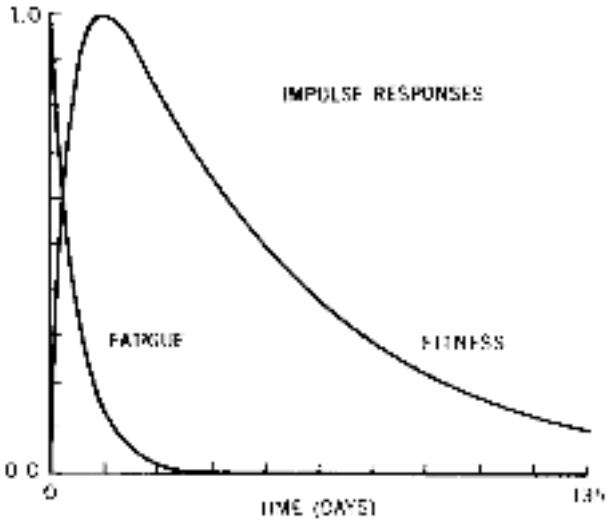
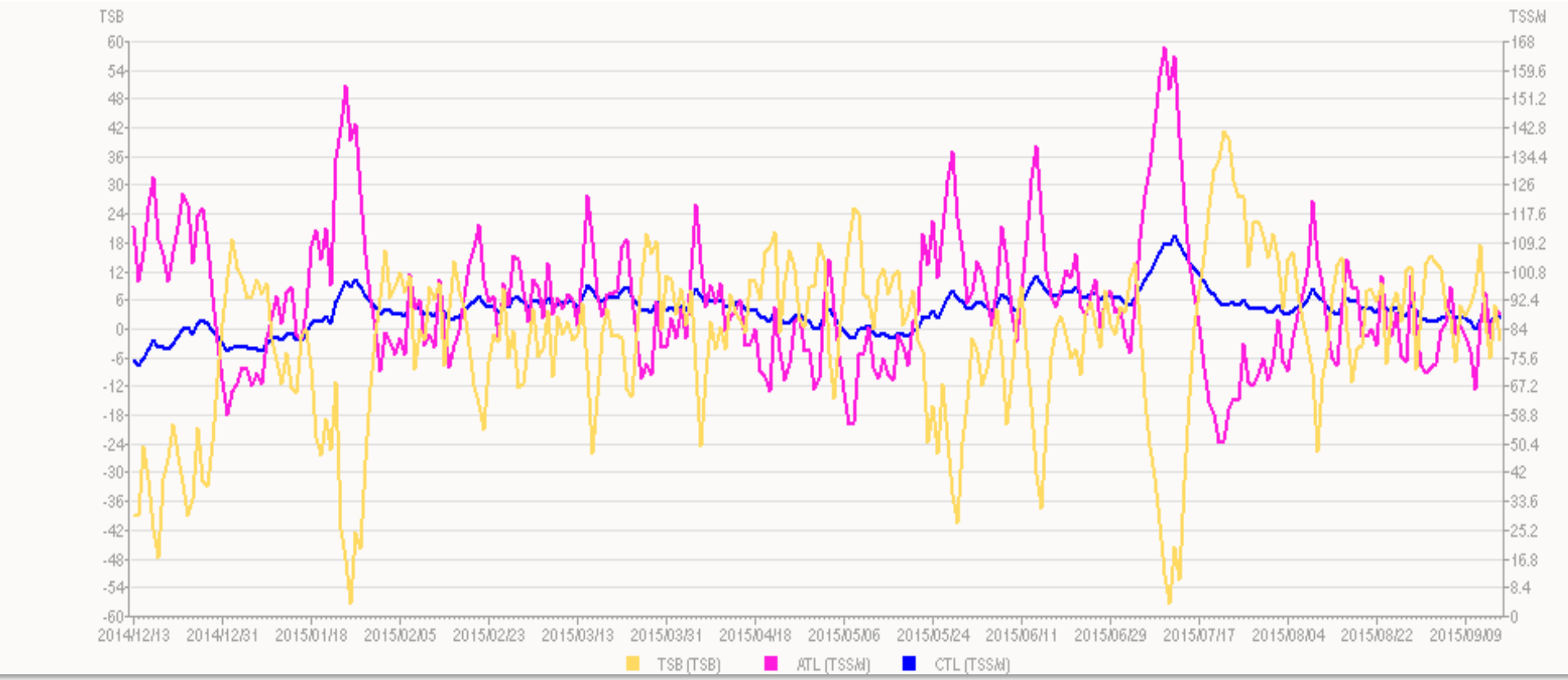


Fig. 5. Impulse responses used for fitness and fatigue functions.

TrainingPeaks™ Performance Management Chart



TrainingPeaks™ Performance Management Chart

TrainingPeaks ™ with Coggan PMC

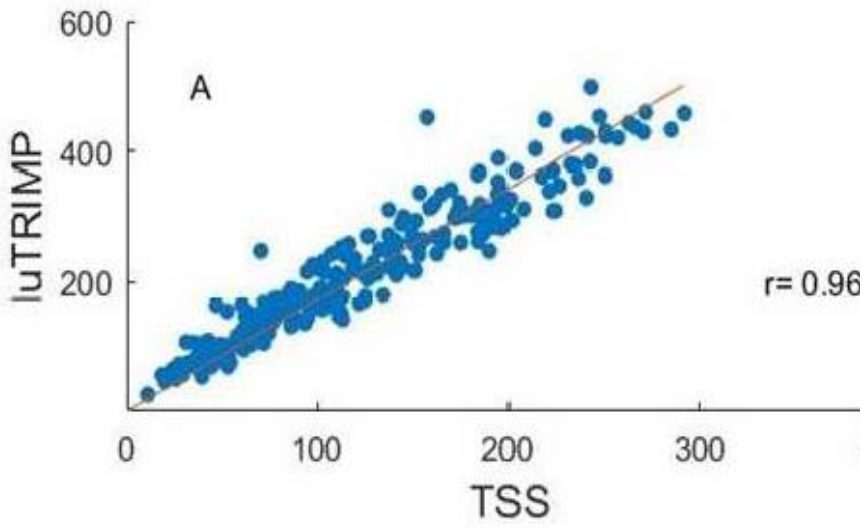
- CTL = Weighted scoring based on power
- 100TSS = 60min @ FTP
- 42 day CTL & 7 day ATL
- TSB based on ATL/CTL ratio

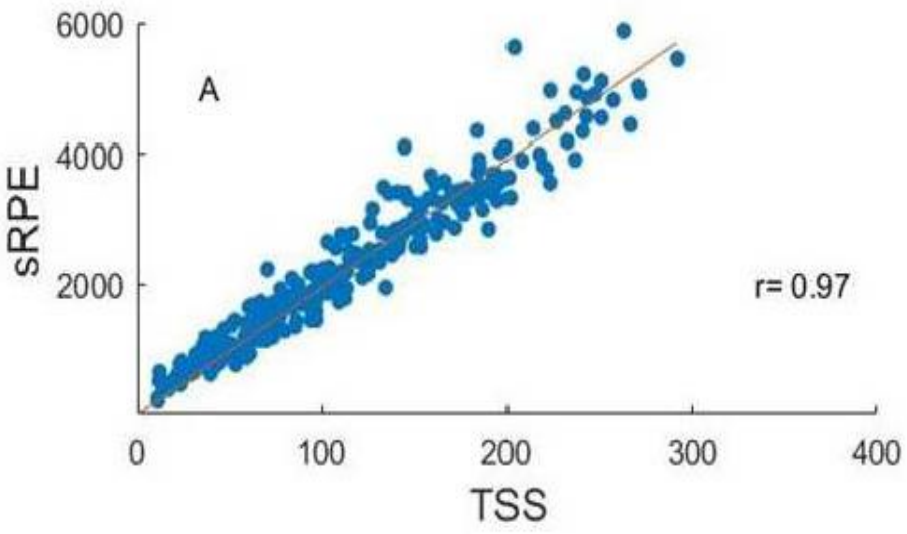
External Load metrics in cycling

Relationship Between Various Training Load Measures in Elite Cyclists during Training, Road Races and Time Trials

Teun van Erp[1], Carl Foster[1,2] and Jos J. de Koning[1,2]

INTERNATIONAL JOURNAL OF SPORTS PHYSIOLOGY AND PERFORMANCE



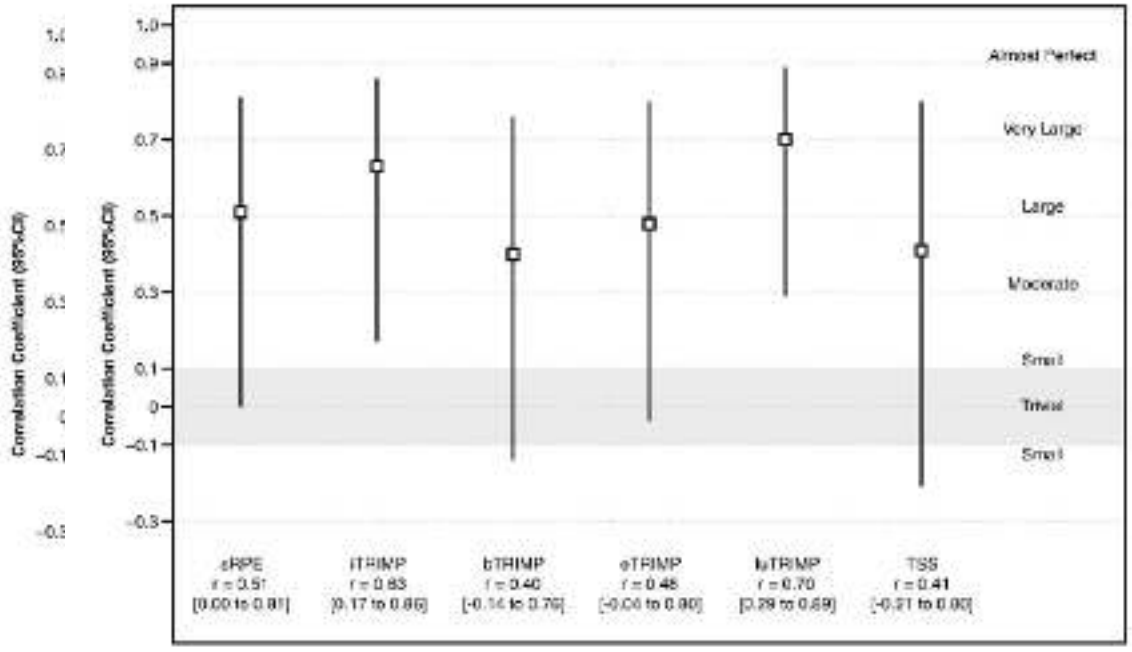


External Load metrics in cycling

Methods of Monitoring Training Load and Their Relationships to Changes in Fitness and Performance in Competitive Road Cyclists

Sanders D, Abt G, Hesselink MK, Myers T, Akubat I.

International Journal of Sports Physiology and Performance



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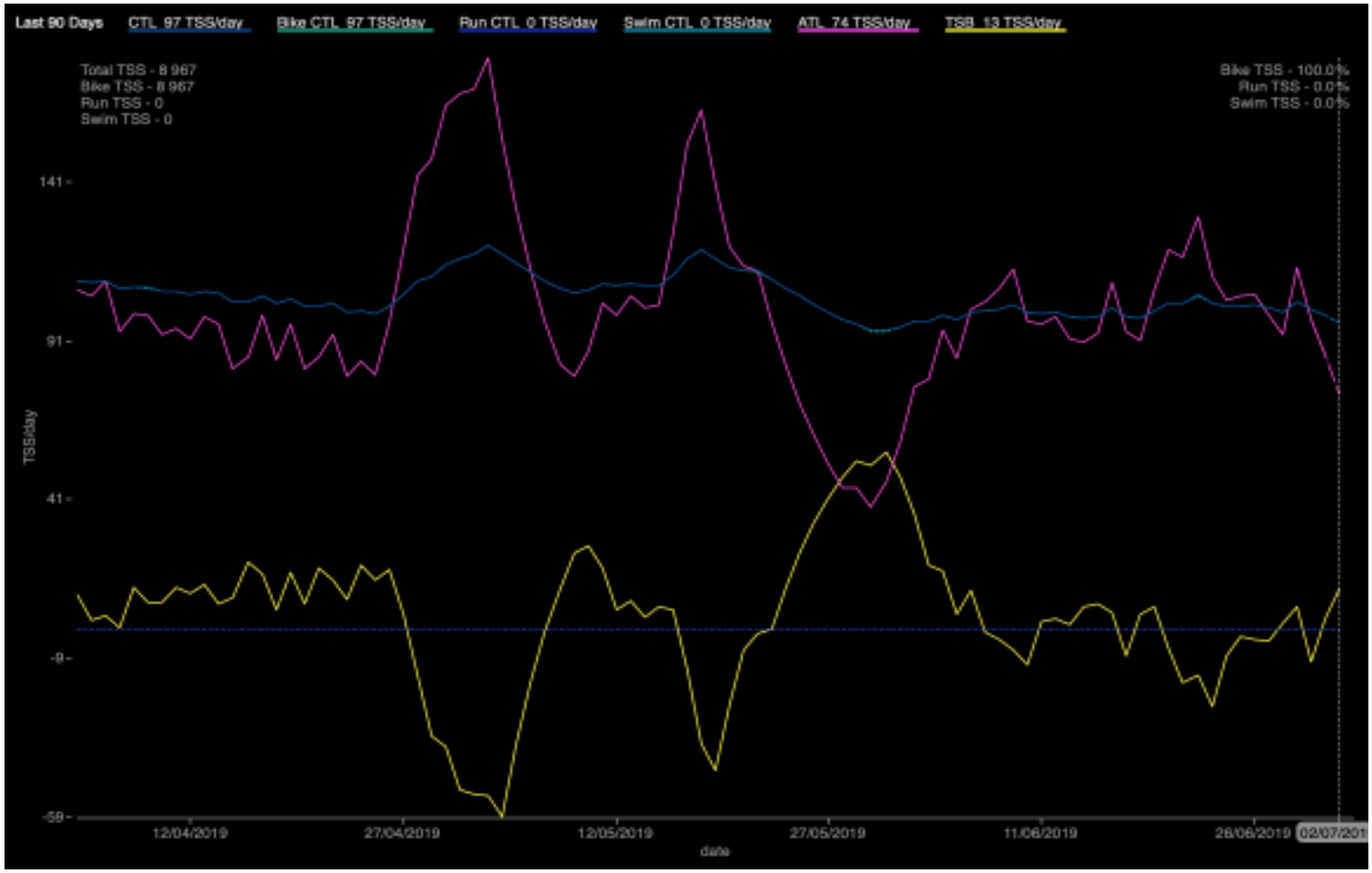
External Load metrics in cycling



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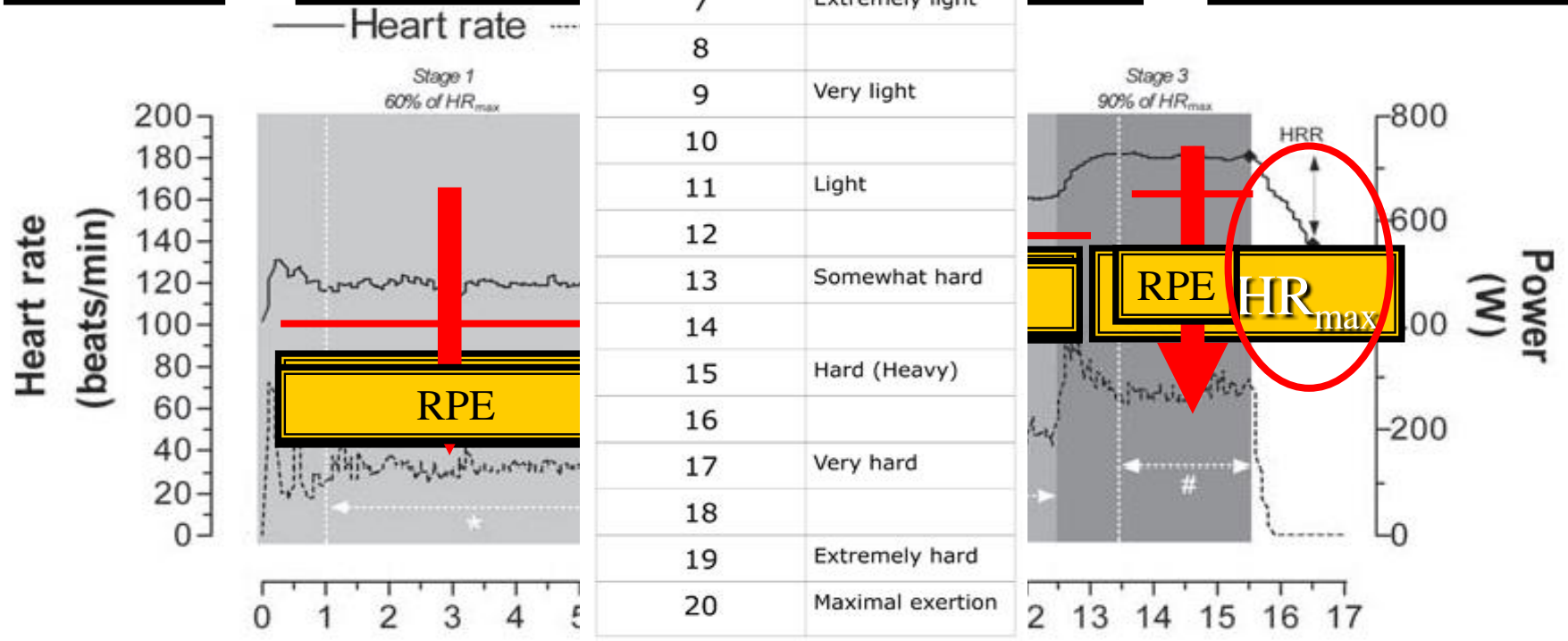
Internal Load metrics in cycling

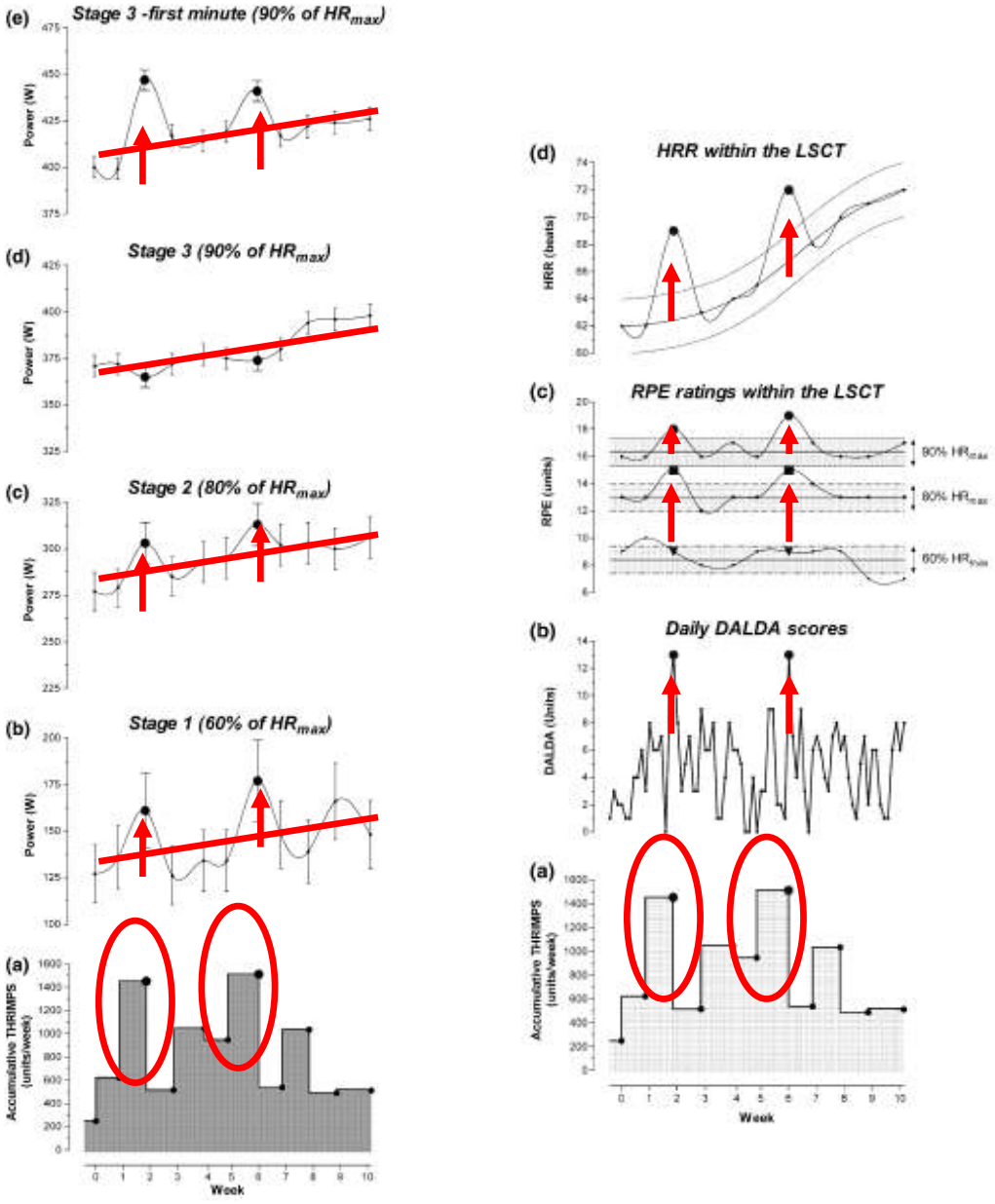
Fixed on HR	Measureme Power	nt:	Measurement: HRR



Borg's RPE Scale	
6	No exertion at all
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (Heavy)
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

Borg RPE scale
© Gunnar Borg, 1970, 1985, 1994, 1998

LSCT


(e) Stage 3 -first minute (90% of HRmax)
(d) Stage 3 (90% of HRmax)
(c) Stage 2 (80% of HRmax)
(b) Stage 1 (60% of HRmax)
Power (W)
(a)
Accumulative THRIMPS (units/week)
Week
(d) HRR within the LSCT
HRR (beats)
(c) RPE ratings within the LSCT
RPE (units)
80% HRmax
80% HRmax
60% Hrmax
(b) Daily DALDA scores
DALDA (Units)
(a)
Accumulative THRIMPS (units/week)
Week

Internal Load metrics in cycling

Reliability and Seasonal Changes of Submaximal Variables to Evaluate Professional Cyclists

Jose A. Rodríguez-Marroyo, Raúl Pernía, José G. Villa, and Carl Foster

International Journal of Sports Physiology and Performance, 2017, 12, 1356-1362

Conclusions

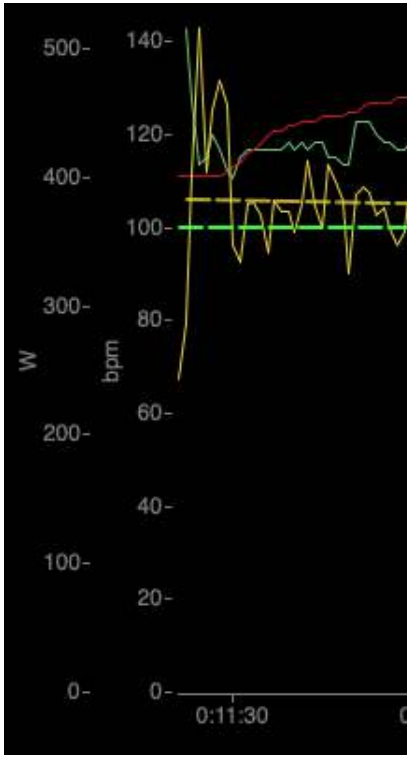
The present study showed the reliability of different submaximal variables to assess cyclists' performances. In addition, the present data extends earlier research suggesting the validity of different submaximal variables to track changes in training status over a cyclist's season. The PWC_{RPE5} seems to be the best single variable to monitor changes in training status over time.

What are we measuring?

- TrainingPeaks™ TSS / CTL / TSB
- SFT Test

3’ SFT

Fixed on Power (FTP)	Measurement: RPE	Measurement: HR	Measurement: TTE



Borg's RPE Scale	
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15	Hard (Heavy)
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18	
19	Extremely hard
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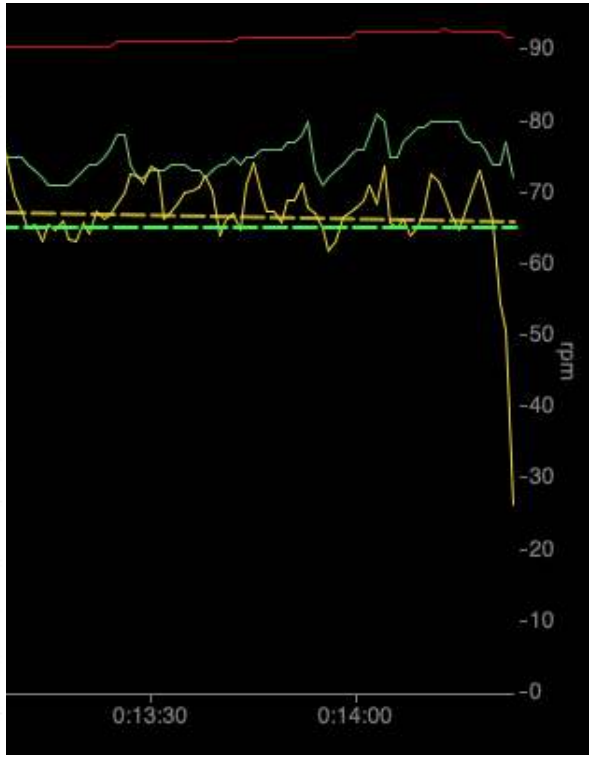
Borg RPE scale
© Gunnar Borg, 1970, 1985, 1994, 1998



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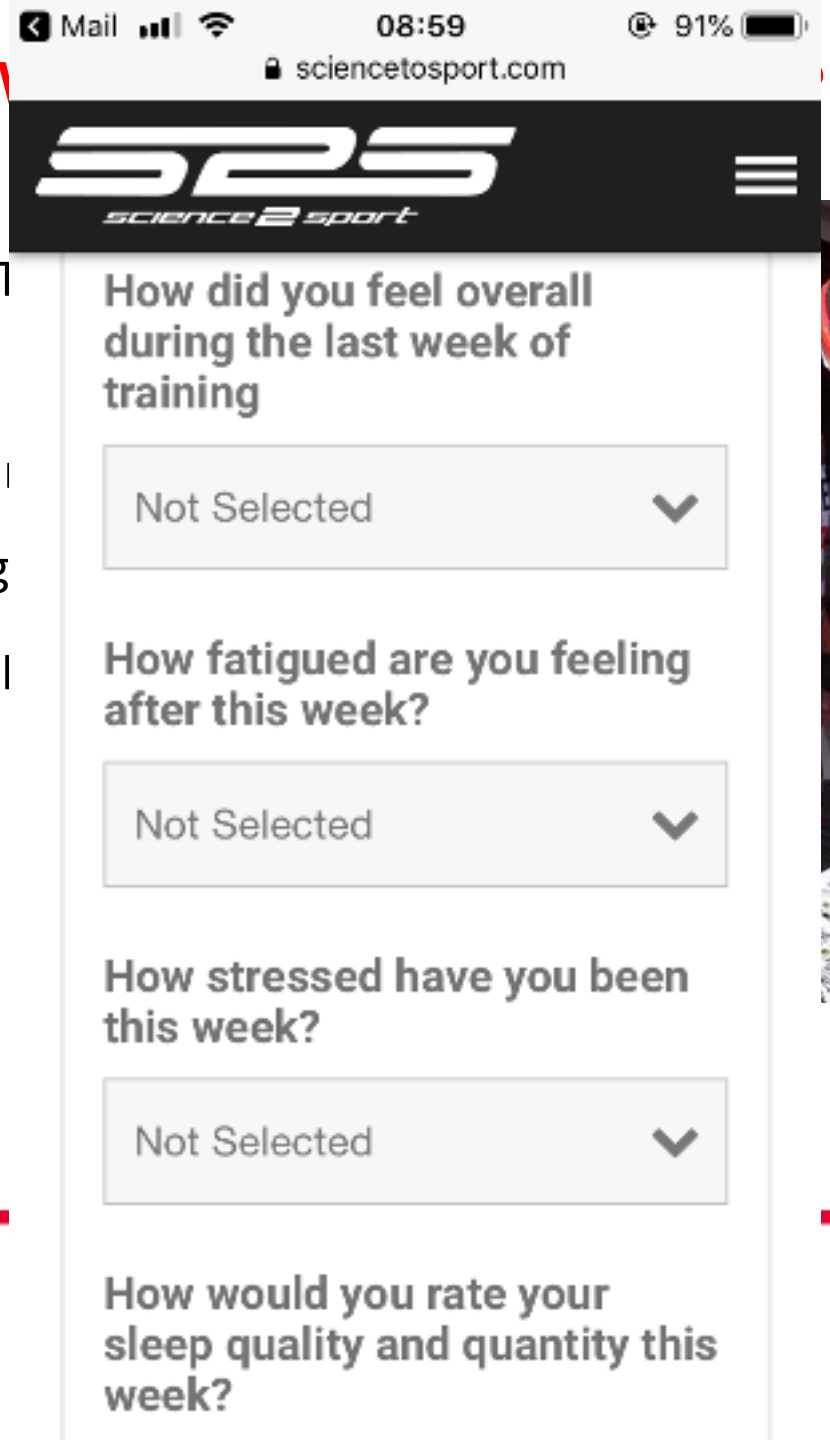
- TrainingPeaks™ T
- SFT Test
- Self reported well
- Performance prog
- 3-4 weekly blood



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Blood panel

Load, Overload, and Recovery in the Athlete: Select Issues for the Team Physician—A Consensus Statement

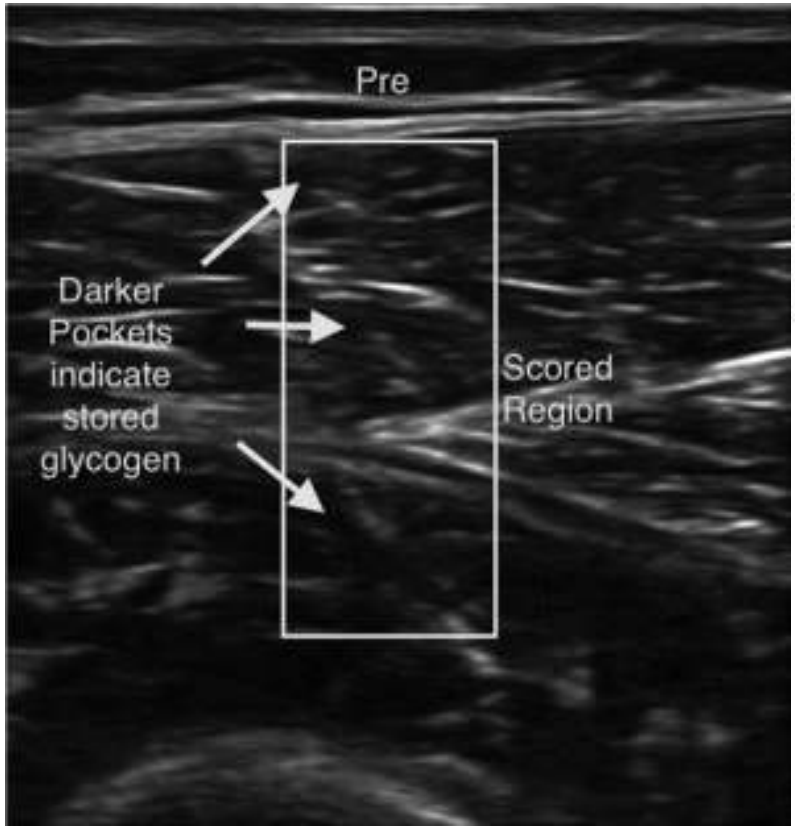
David J. Berkoff, M.D., Chapel Hill, North Carolina
Jeff Bytomski, D.O., Durham, North Carolina
Eric Carson, M.D., Charlottesville, Virginia
Cindy J. Chang, M.D., San Francisco, California
David Coppel, Ph.D., Seattle, Washington
R. Rob Franks, D.O. Marlton, New Jersey
Peter Indelicato, M.D., Gainesville, Florida
Neeru Jayanthi, M.D., Atlanta, Georgia
Mark Kovacs, Ph.D., Atlanta, Georgia
Jason Matuszak, M.D., Amherst, New York
Claude T. Moorman, III, M.D., Charlotte, North Carolina

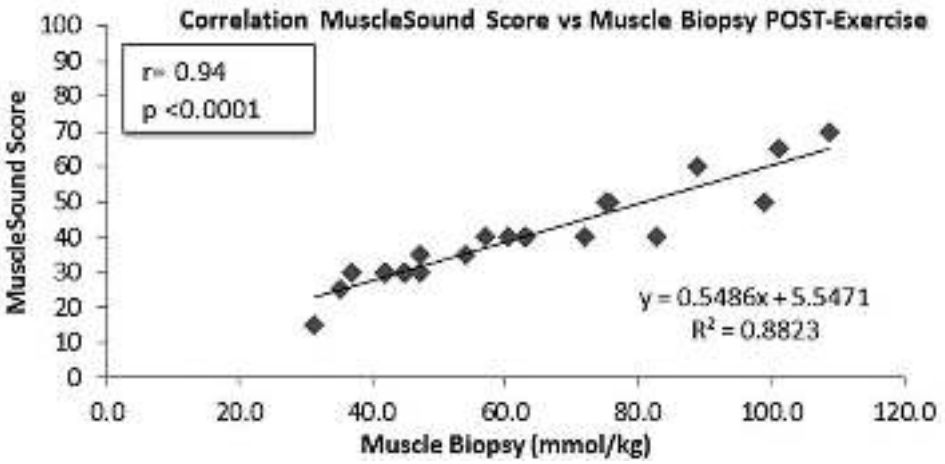
Haematological indexes
AST / ALT / LDH
Creatine Kinase
Urea / Creatinine
WCC / Differential
CRP / ESR
Ferritin
Magnesium
Cortisol
Testosterone

What are we measuring?

- TrainingPeaks™ TSS / CTL / TSB
- SFT Test
- Self reported wellness
- Performance progression
- 3-4 weekly blood panel
- Anthropometrics
- Non-invasive [muscle glycogen]

Muscle glycogen concentration



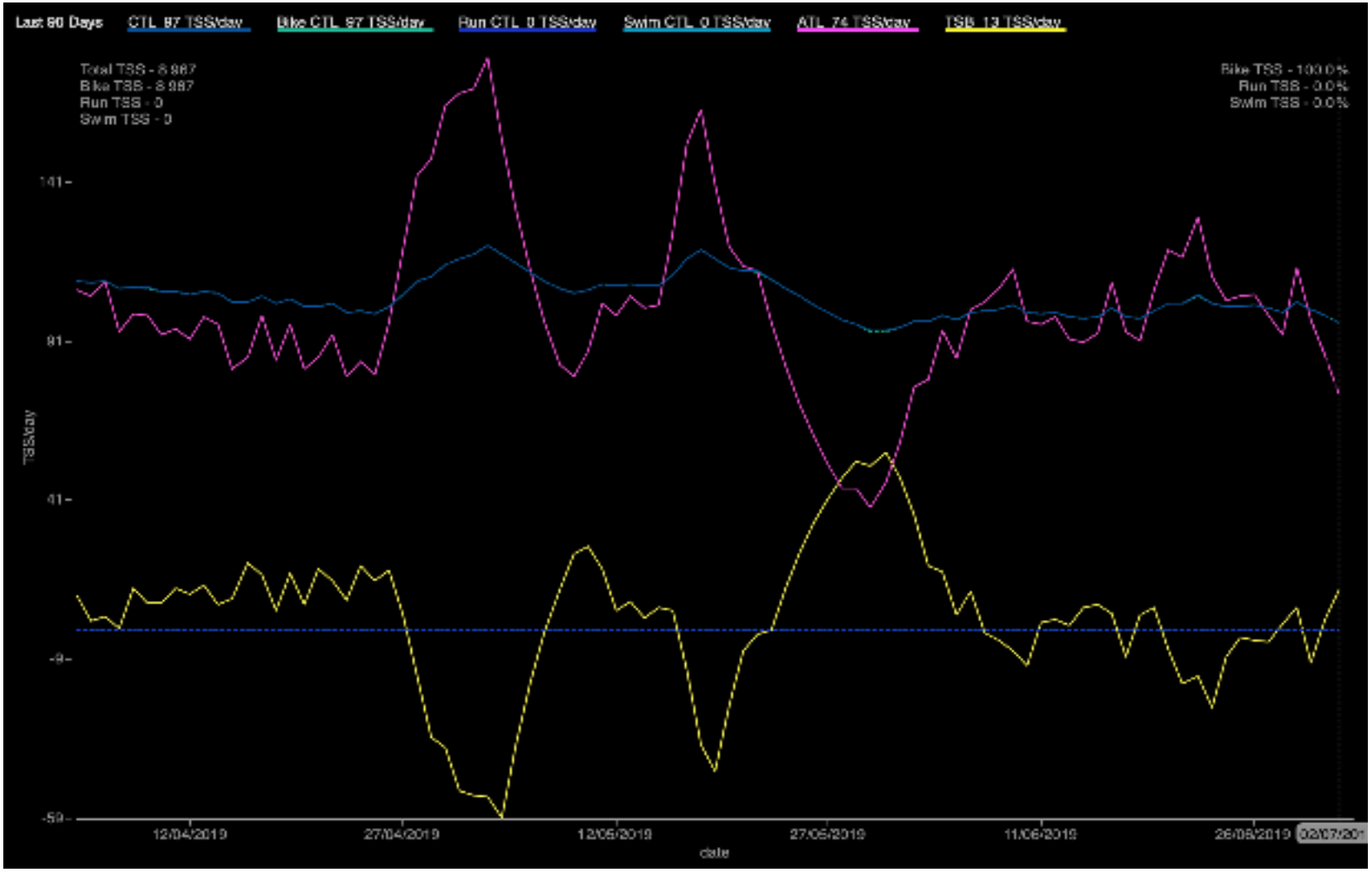


Hill, John & San Millán, Iñigo. (2014). Validation of Musculoskeletal Ultrasound to Assess and Quantify Muscle Glycogen Content. A Novel Approach. The Physician and sportsmedicine. 42. 45-52

What are we measuring?

- TrainingPeaks™ TSS / CTL / TSB
- SFT Test
- Self reported wellness
- Performance progression
- 3-4 weekly blood panel
- Anthropometrics
- Non-invasive [muscle glycogen]
- Race ROS
- Race urine osmolality
- Some really secret stuff

Insights



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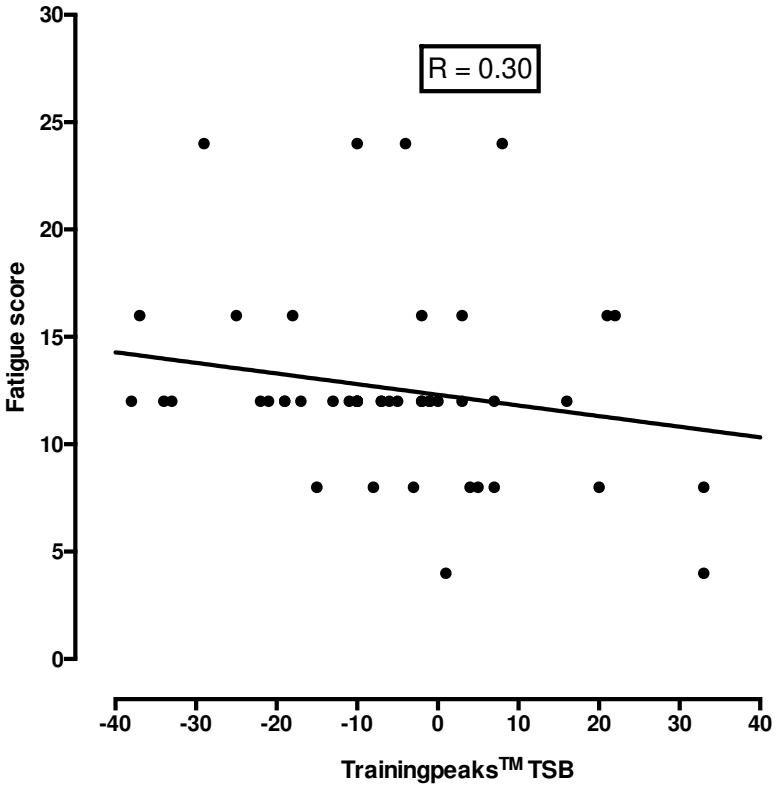
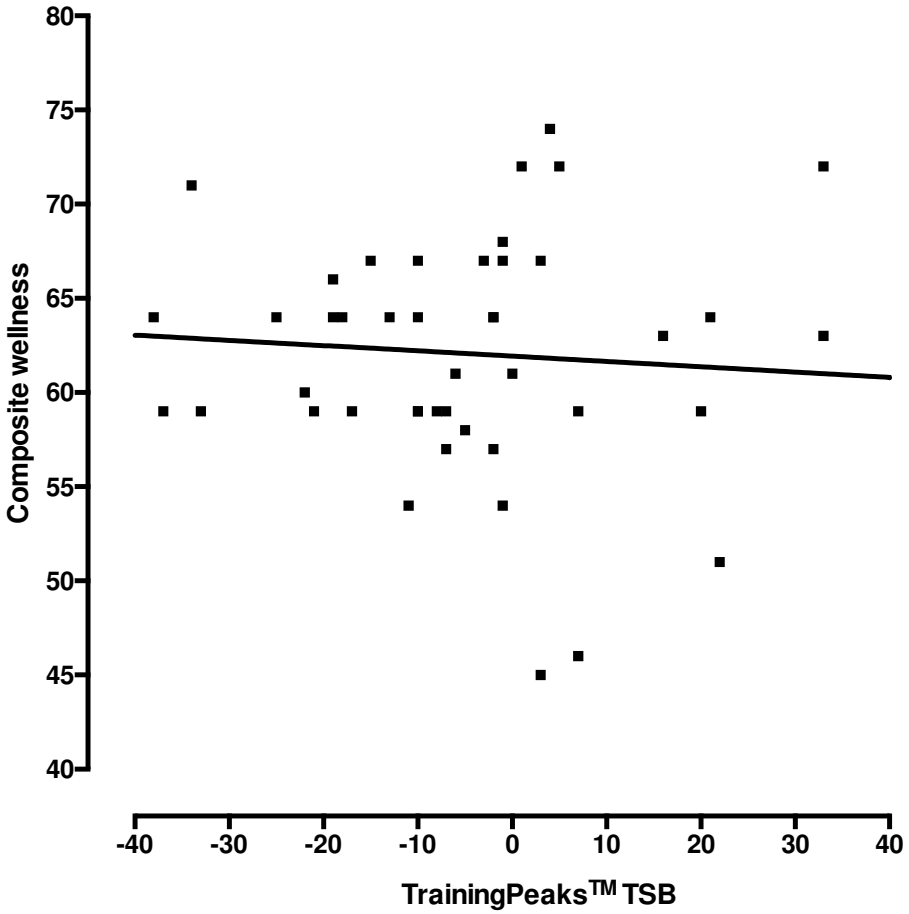
Insights


R = 0.30
Fatigue score
30
25
20
15
10
5
0
-40
-30
-20
-10
0
10
20
30
40
Trainingpeaks™ TSB

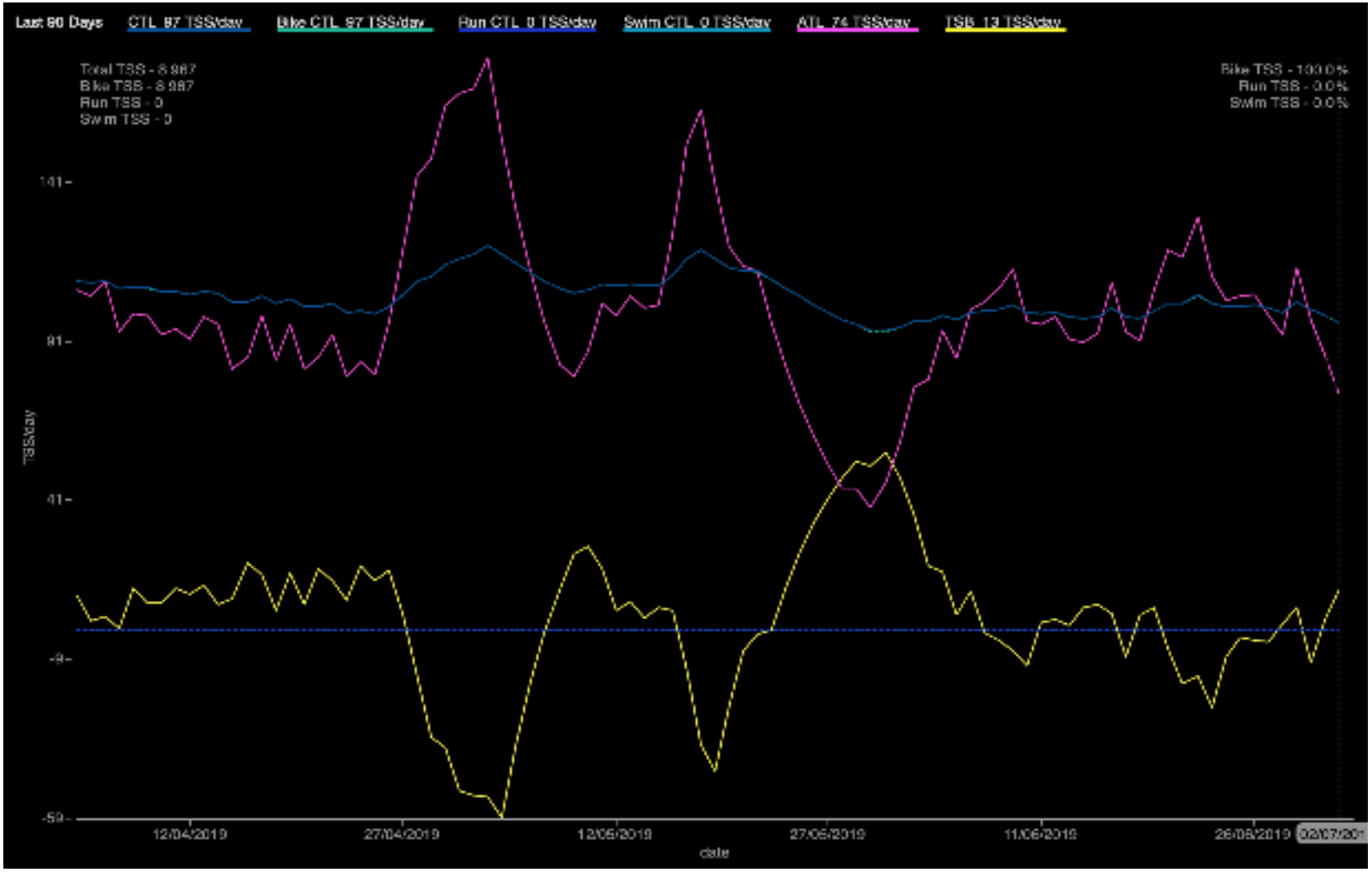

LEXUS
UAE

Insights


Composite wellness
80
75
70
65
60
55
50
45
40
-40
-30
-20
-10
0
10
20
30
40
TrainingPeaks™ TSB


UAE
TEAM
UAE
UAE
FAB
Emirates

Insights



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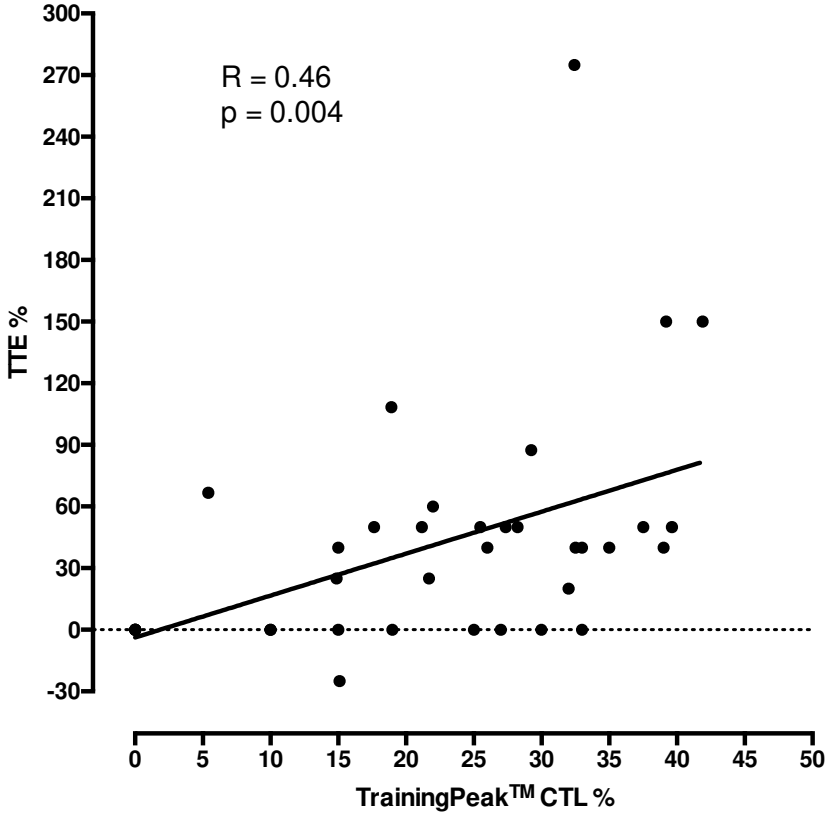
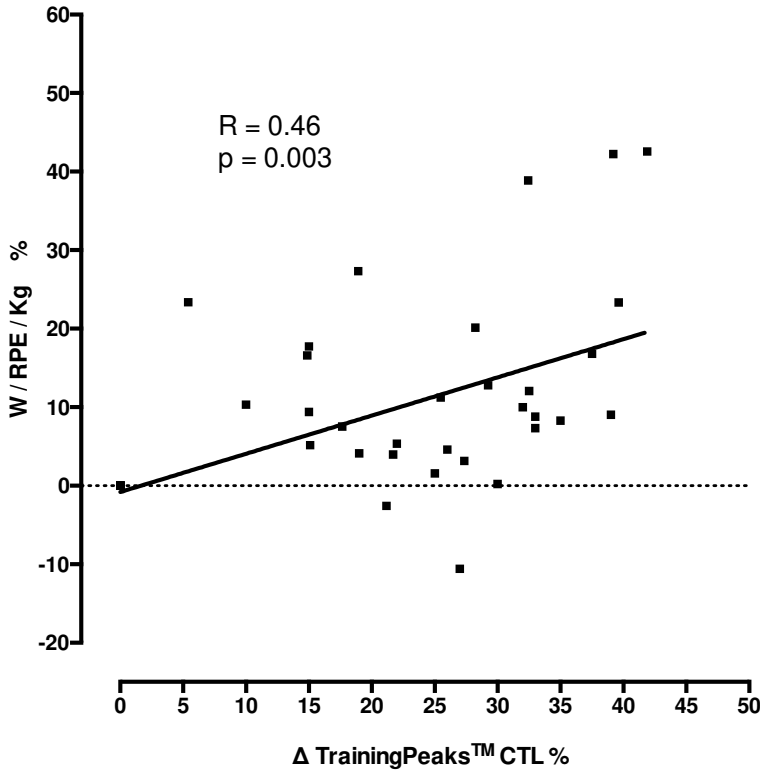
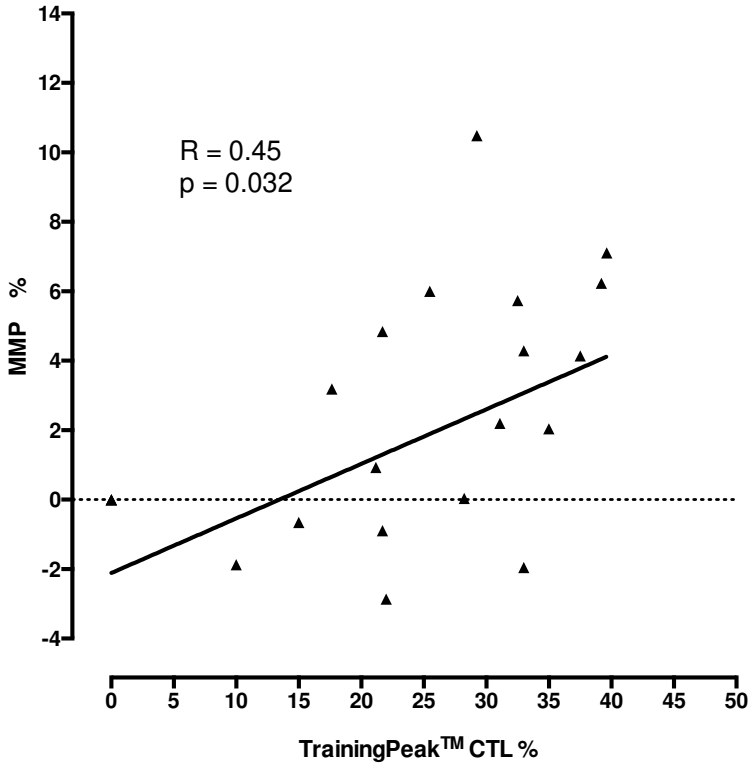
New insights



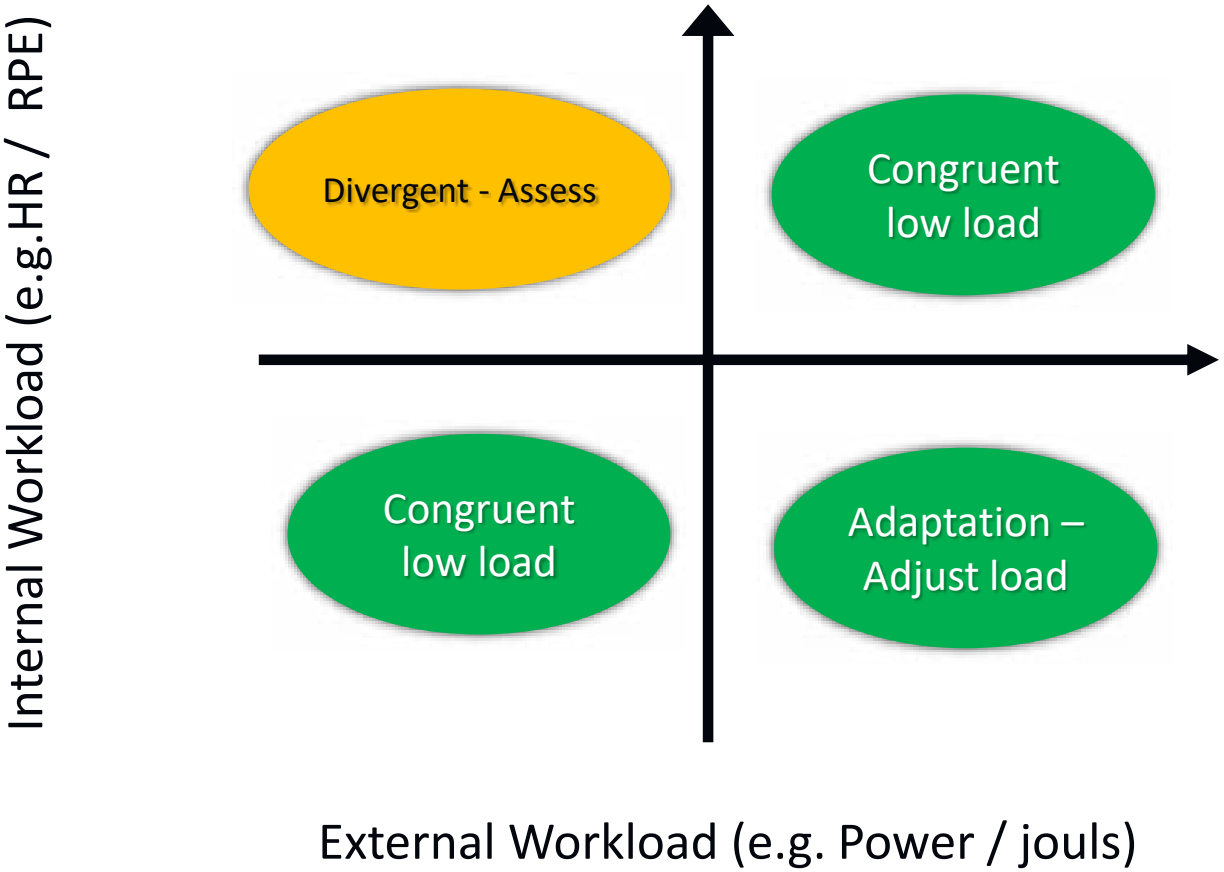
New insights



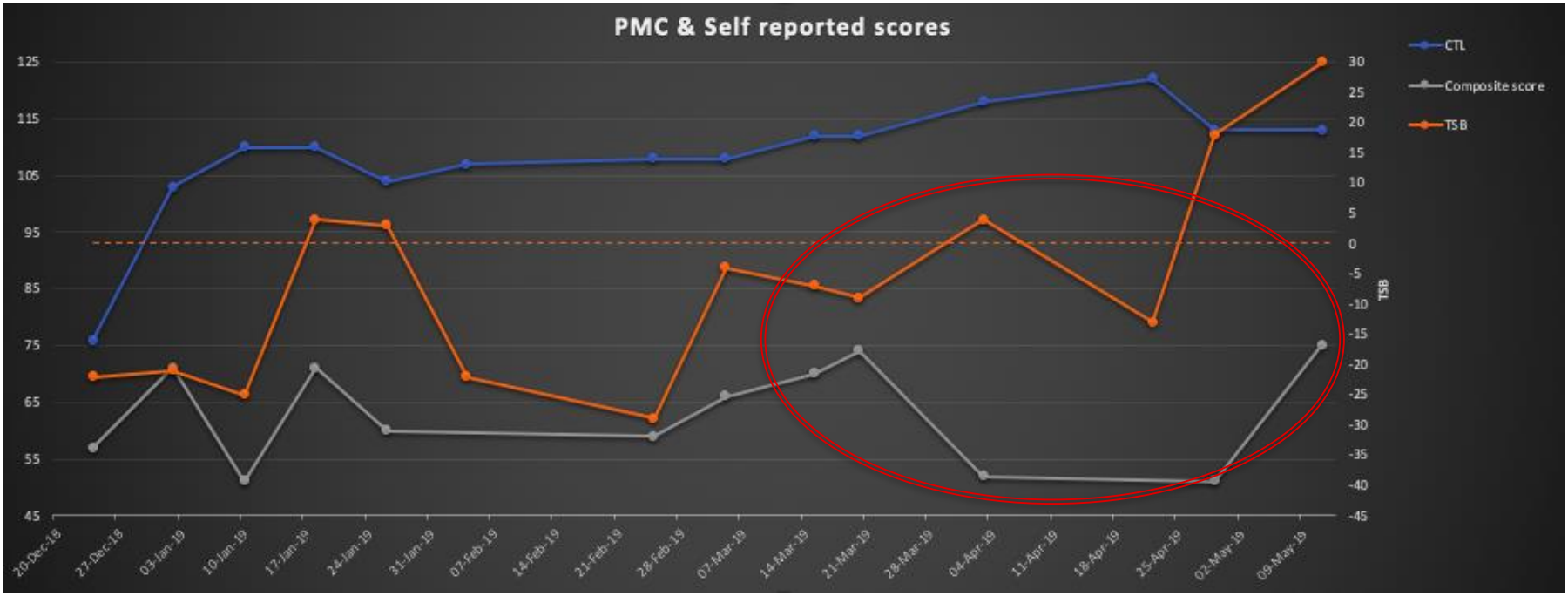
New insights



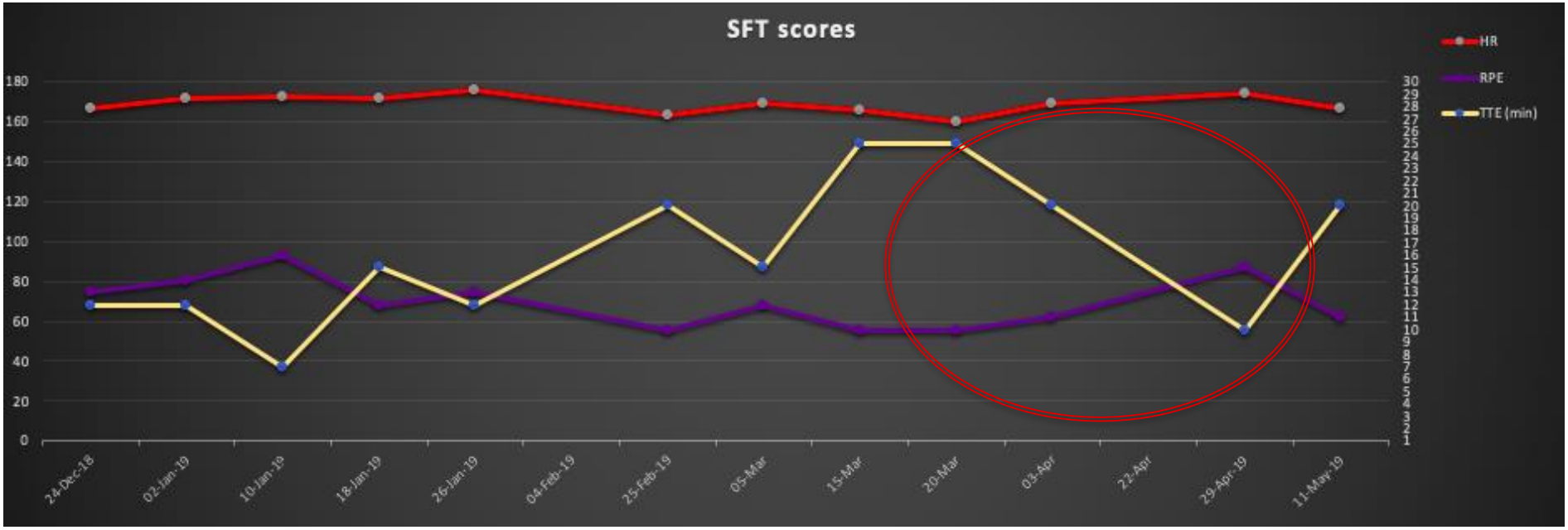
Congruency


Internal Workload (e.g.HR / RPE)
Divergent - Assess
Congruent low load
Congruent low load
Adaptation – Adjust load
External Workload (e.g. Power / jouls)

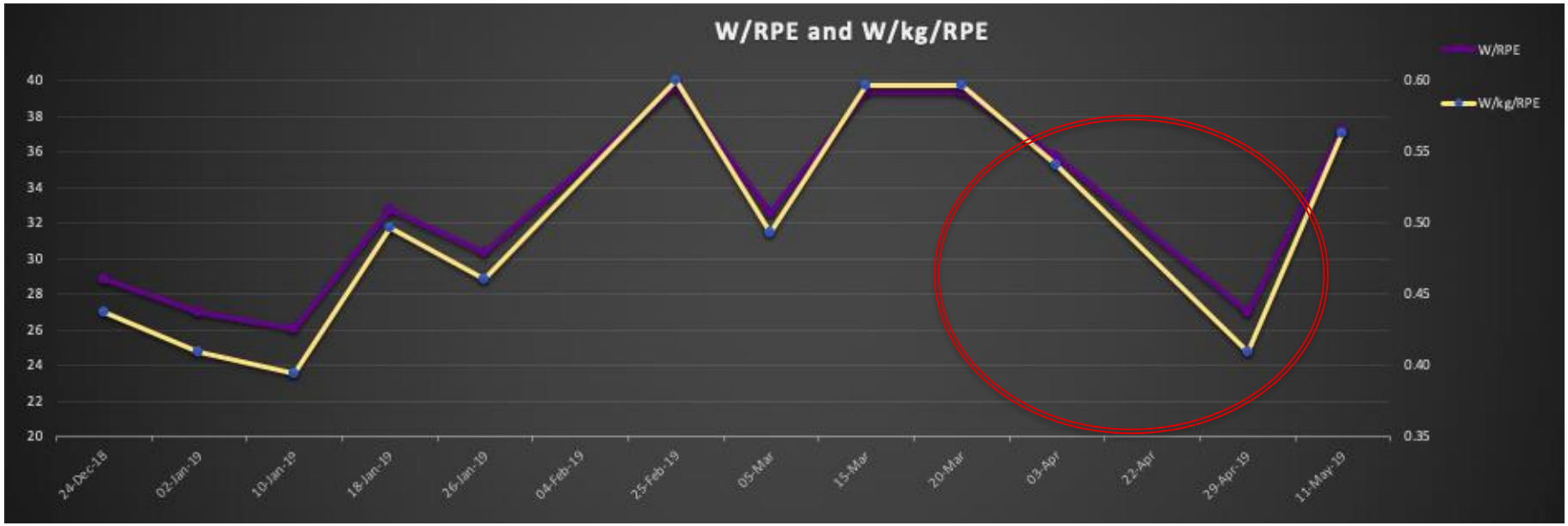
Case 1


PMC & Self reported scores
CTL
Composite score
TSB
125
115
105
95
85
75
65
55
45
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
TSB
20-Dec-18
27-Dec-18
03-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
07-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
07-Mar-19
14-Mar-19
21-Mar-19
28-Mar-19
04-Apr-19
11-Apr-19
18-Apr-19
25-Apr-19
02-May-19
09-May-19

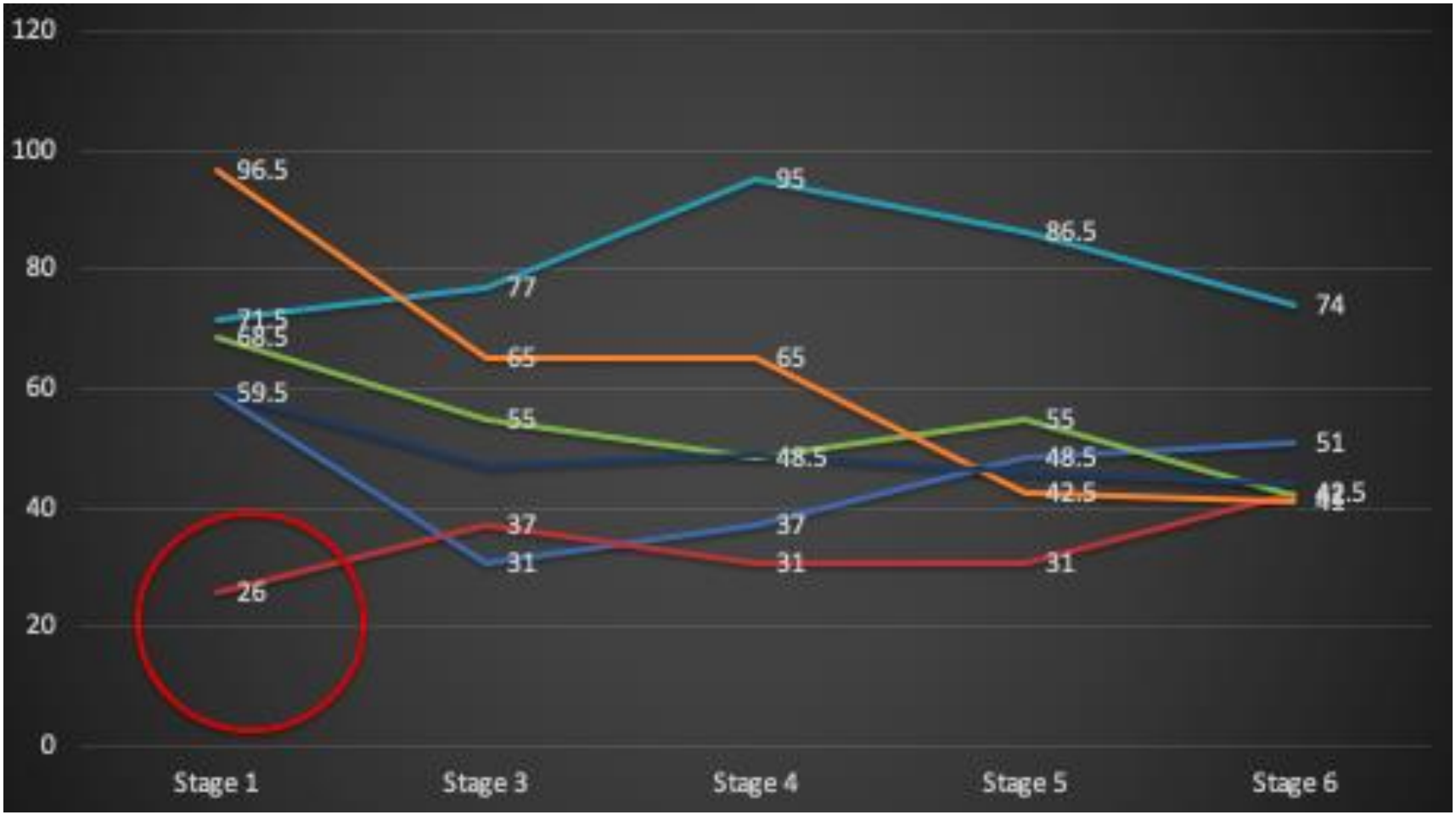
Case 1


SFT scores
HR
RPE
TTE (min)
180
160
140
120
100
80
60
40
20
0
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
24-Dec-18
02-Jan-19
10-Jan-19
18-Jan-19
26-Jan-19
04-Feb-19
25-Feb-19
05-Mar
15-Mar
20-Mar
03-Apr
22-Apr
29-Apr-19
11-May-19

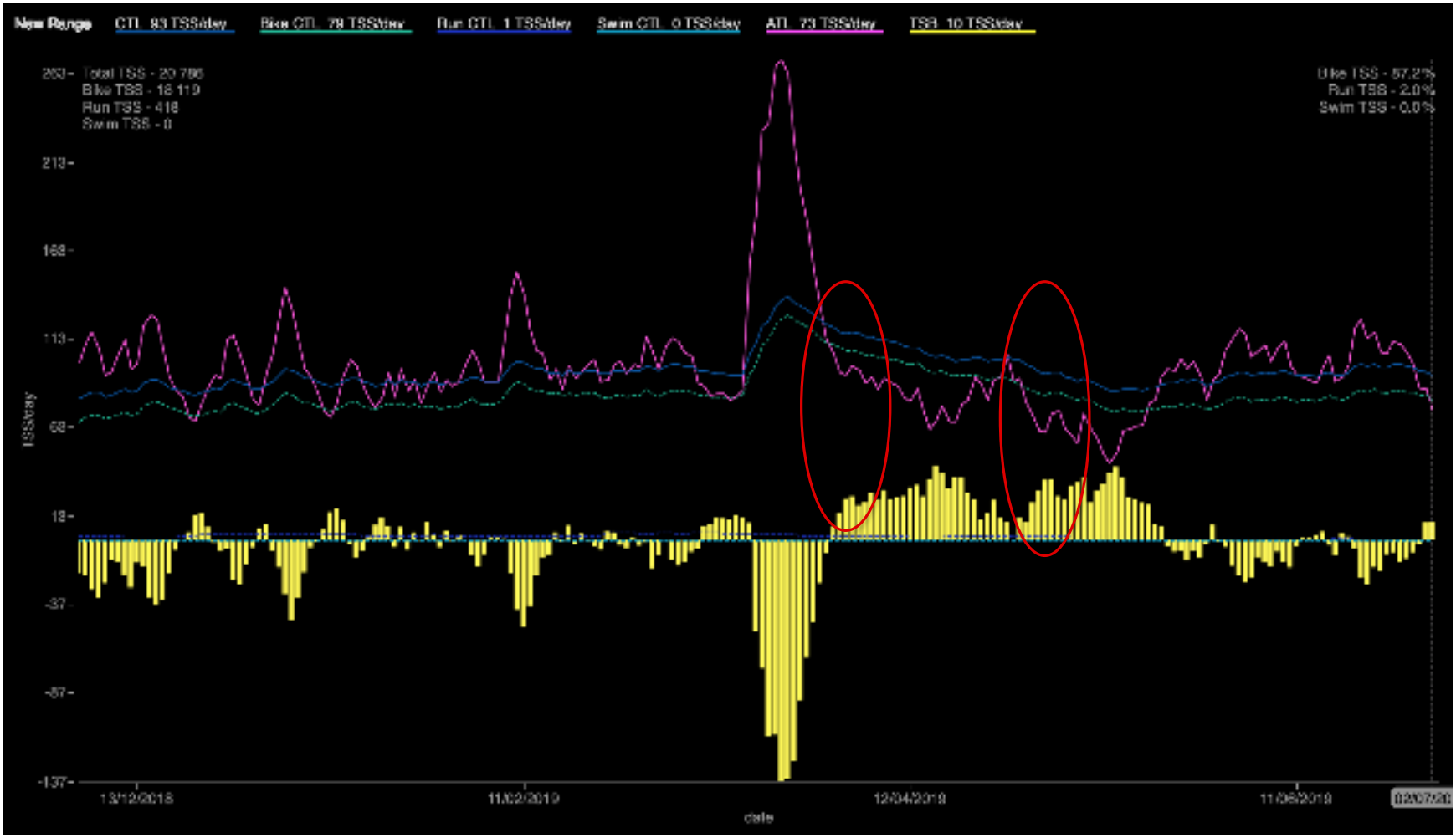
Case 1


W/RPE and W/kg/RPE
W/RPE
W/kg/RPE
40
38
36
34
32
30
28
26
24
22
20
0.60
0.55
0.50
0.45
0.40
0.35
24-Dec-18
02-Jan-19
10-Jan-19
18-Jan-19
26-Jan-19
04-Feb-19
25-Feb-19
05-Mar
15-Mar
20-Mar
03-Apr
22-Apr
29-Apr-19
11-May-19

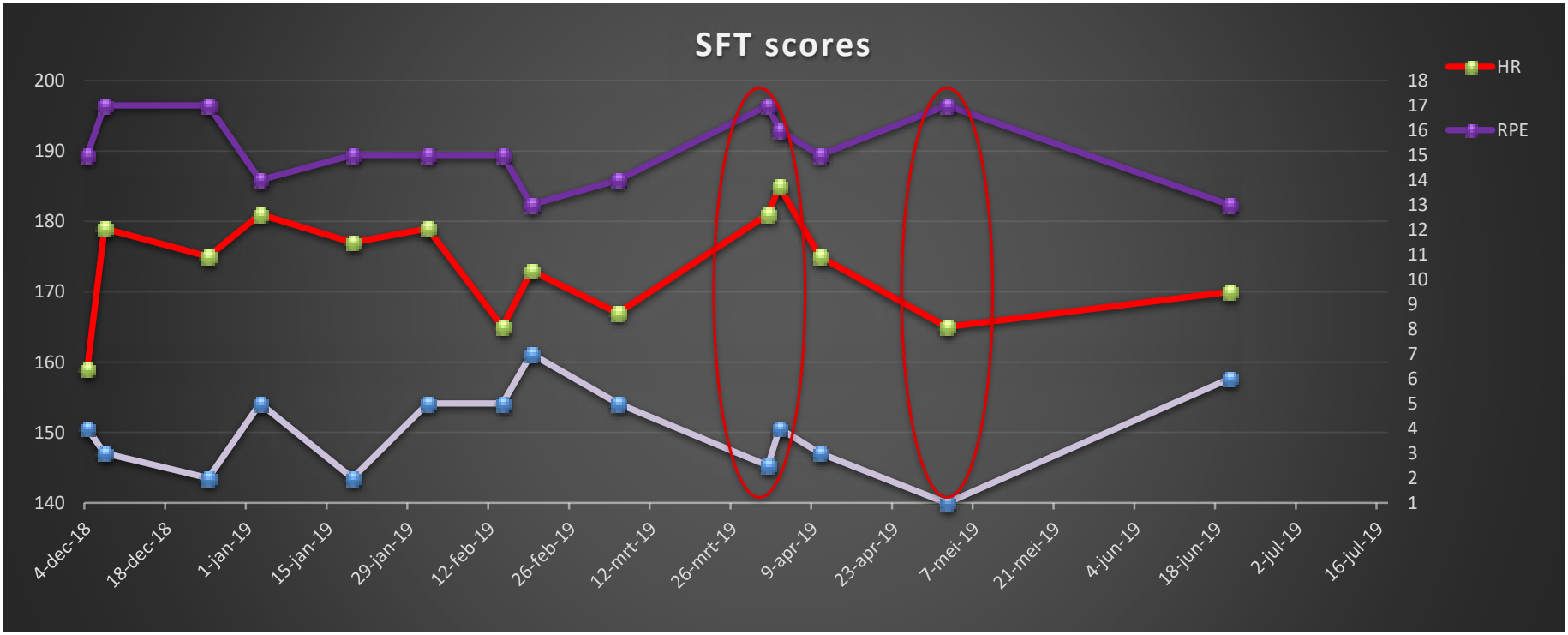
Case 1


120
100
80
60
40
20
0
96.5
95
86.5
74
77
71.5
68.5
65
65
59.5
55
55
48.5
48.5
51
42.5
42.5
37
37
31
31
31
26
Stage 1
Stage 3
Stage 4
Stage 5
Stage 6

Case 2


New Range
CTL 93 TSS/day
Bike CTL 79 TSS/day
Run CTL 1 TSS/day
Swim CTL 0 TSS/day
ATL 73 TSS/day
TSB 10 TSS/day
Total TSS - 20 786
Bike TSS - 18 119
Run TSS - 418
Swim TSS - 0
Bike TSS - 97.2%
Run TSS - 2.0%
Swim TSS - 0.0%
213
168
123
78
18
-37
-87
-137
TSS/day
13/12/2018
11/02/2019
12/04/2019
11/06/2019
02/07/20
date

Case 2


SFT scores
HR
RPE
200
190
180
170
160
150
140
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
4-dec-18
18-dec-18
1-jan-19
15-jan-19
29-jan-19
12-feb-19
26-feb-19
12-mrt-19
26-mrt-19
9-apr-19
23-apr-19
7-mei-19
21-mei-19
4-jun-19
18-jun-19
2-jul-19
16-jul-19

Thank You

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