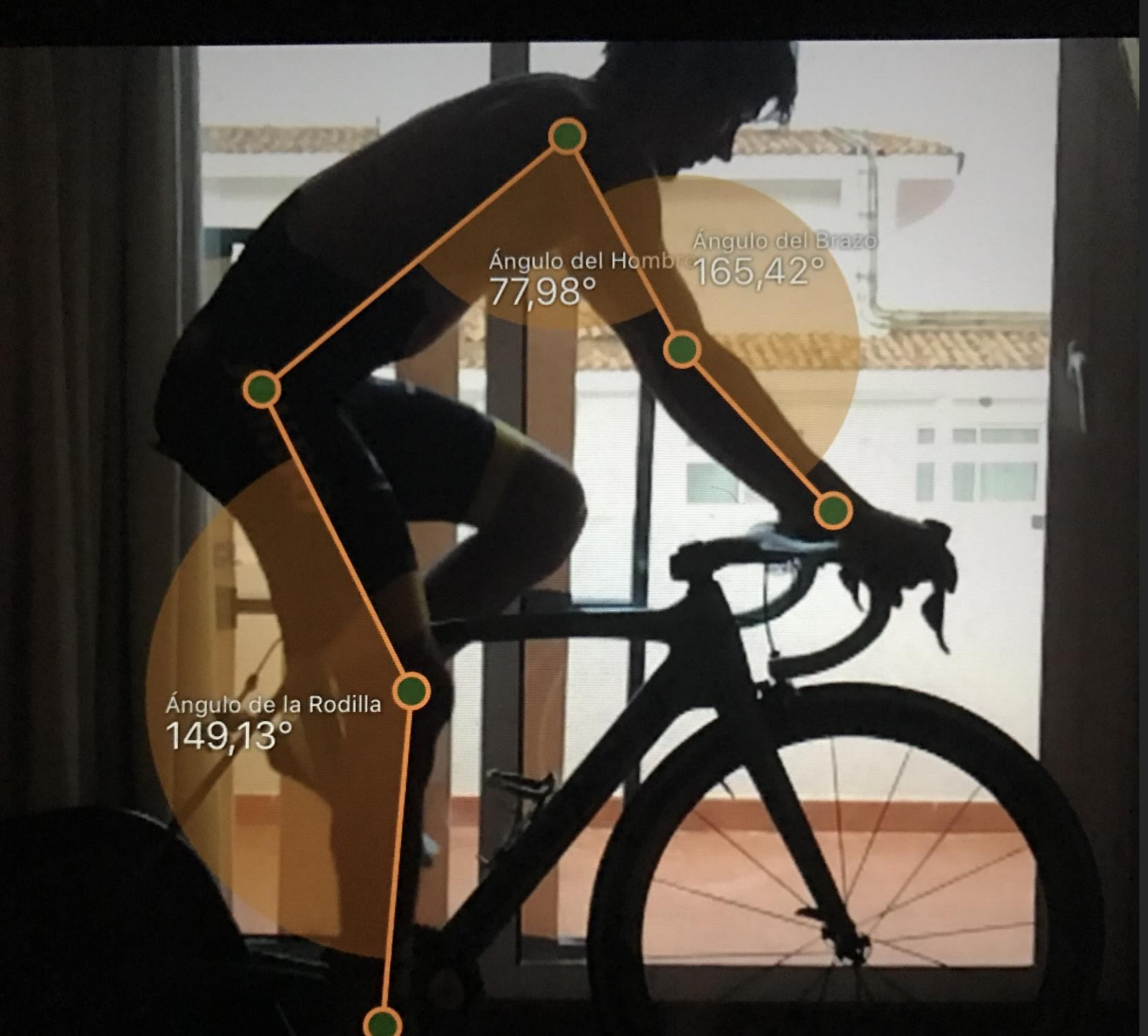
Biomechanical follow up in elite road cycling

Jon iriberri



Starting situation bike fitting: Training camp preseason screening

….We should look less to the bicycle and more to the cyclist….
(Happy Freedman)

…convert the bike fit event in a process…
(Phil Caven)

Does the actual model maximice the performance?

Is the biomechanical screening done looking for performance?

If the performance is good, does it mean that biomechanics assesment is optimized?

Bikefiting objetives

- PROFESSIONAL RIDER
- 1) Performance
- 2) Injury prevention
- 3) Avoid Disconfort

- AMATEUR RIDER
- 1) Avoid disconfort
- 2) Injury preventions
- 3) Performance

Conditions for biomechanical assesment and follow-up

- Easy to get data
- High frecuency of recording data
- Minimal human dependence
- Related to real race performance
- Cloud based

Objective parameters for continuous biomechanical assessment and optimization

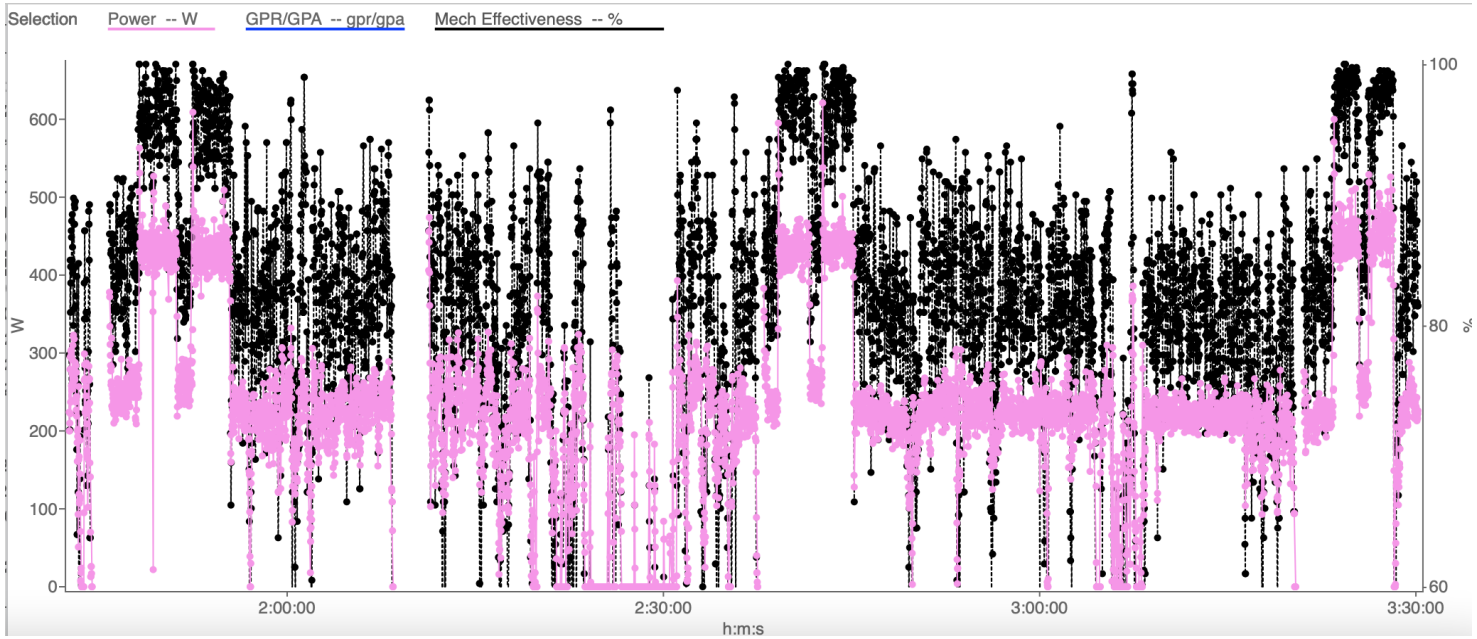
1) Mechanical efficiency

2) Gpr/Gpa ratio

3) Torque profile optimization

4) Asymmetry

Mechanical efficiency: limitations



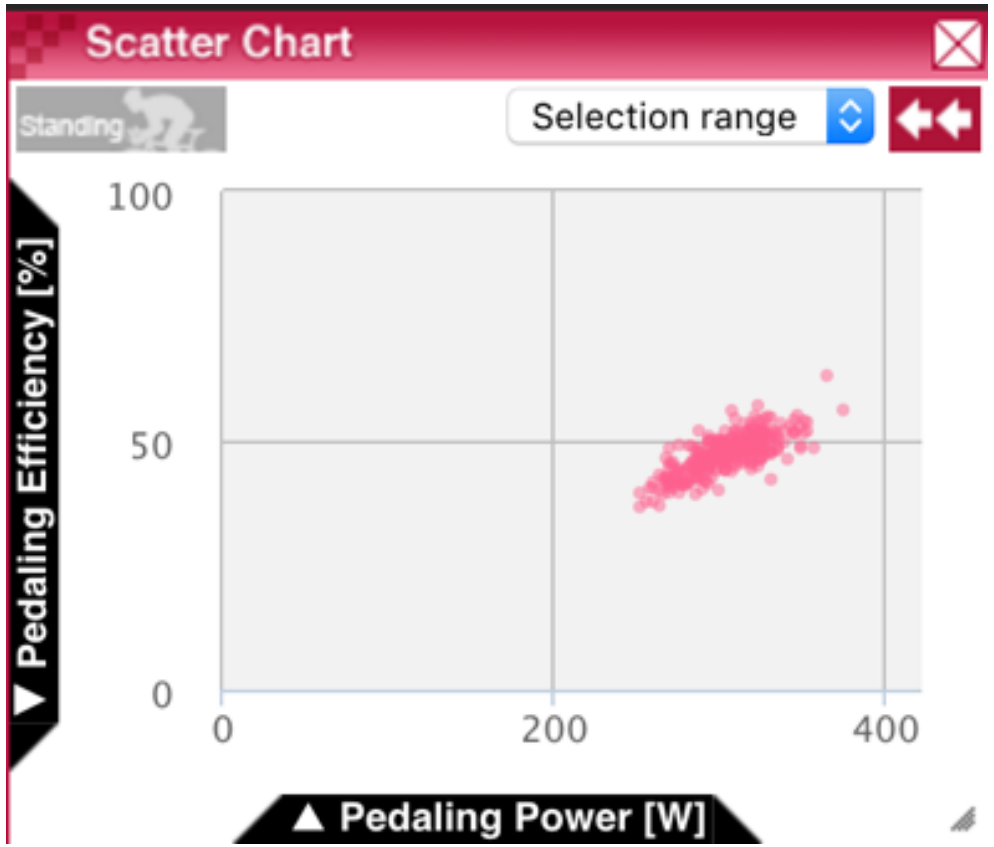
J Sci Cycling. Vol. 2(1), 11-24

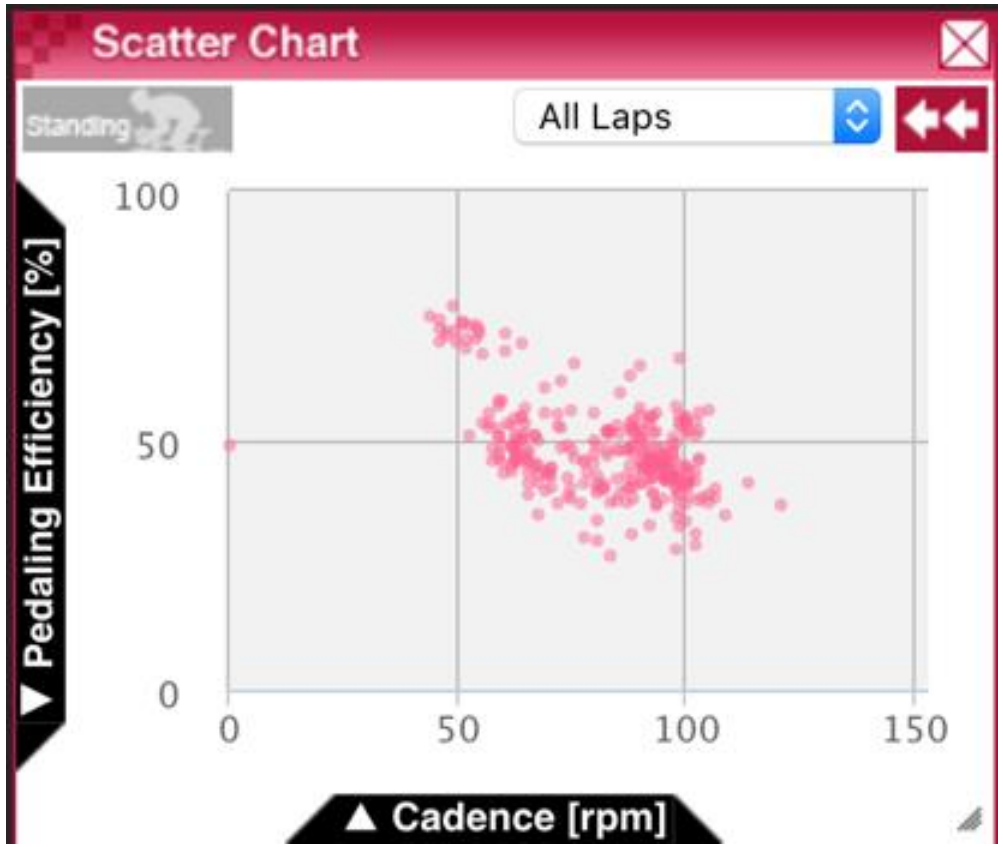
REVIEW ARTICLE

Open Access

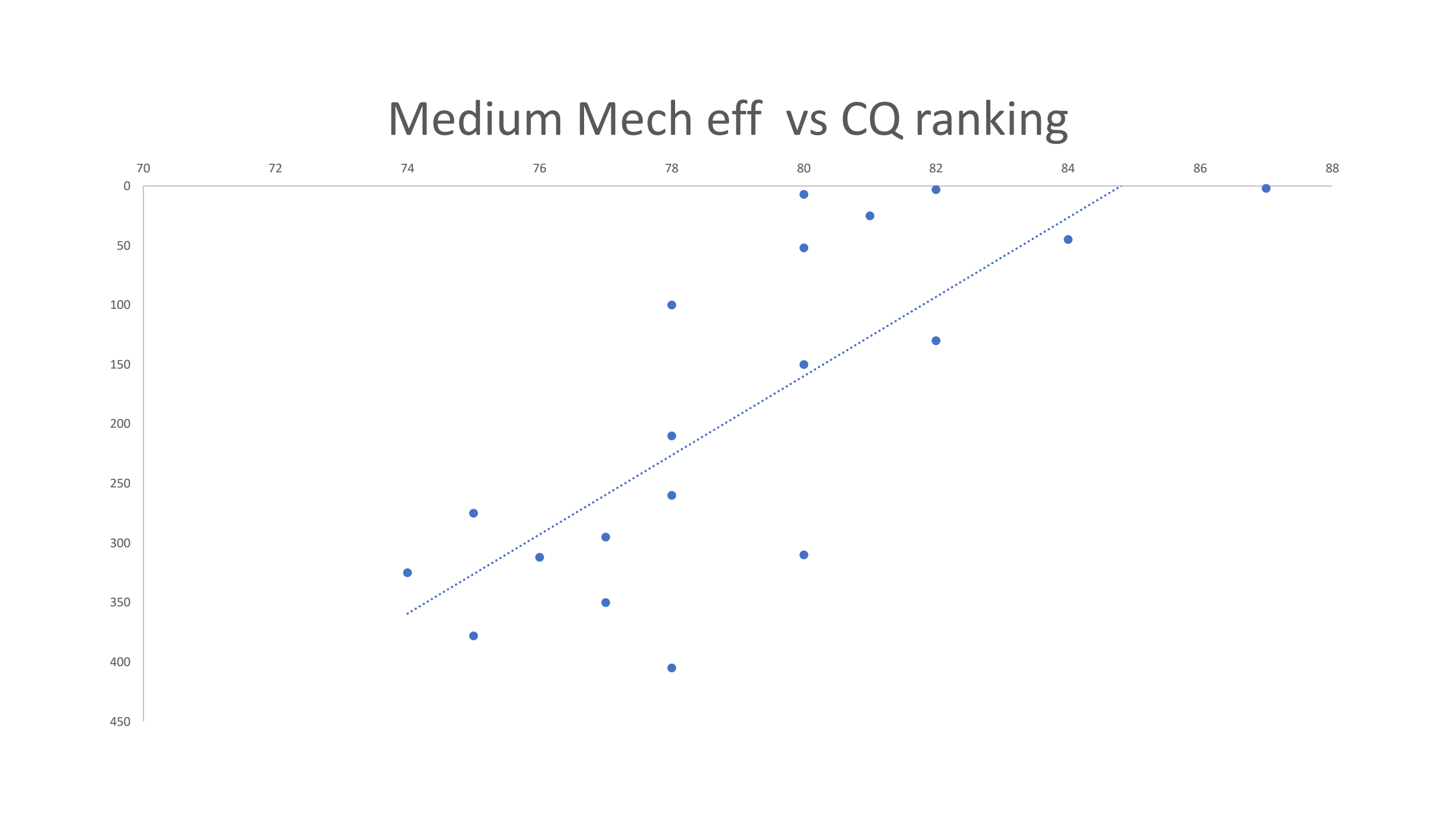
Pedal force effectiveness in Cycling: a review of constraints and training effects

Rodrigo R Bini[1, 2]✉, Patria Hume[1], James Croft[3], Andrew Kilding[1]

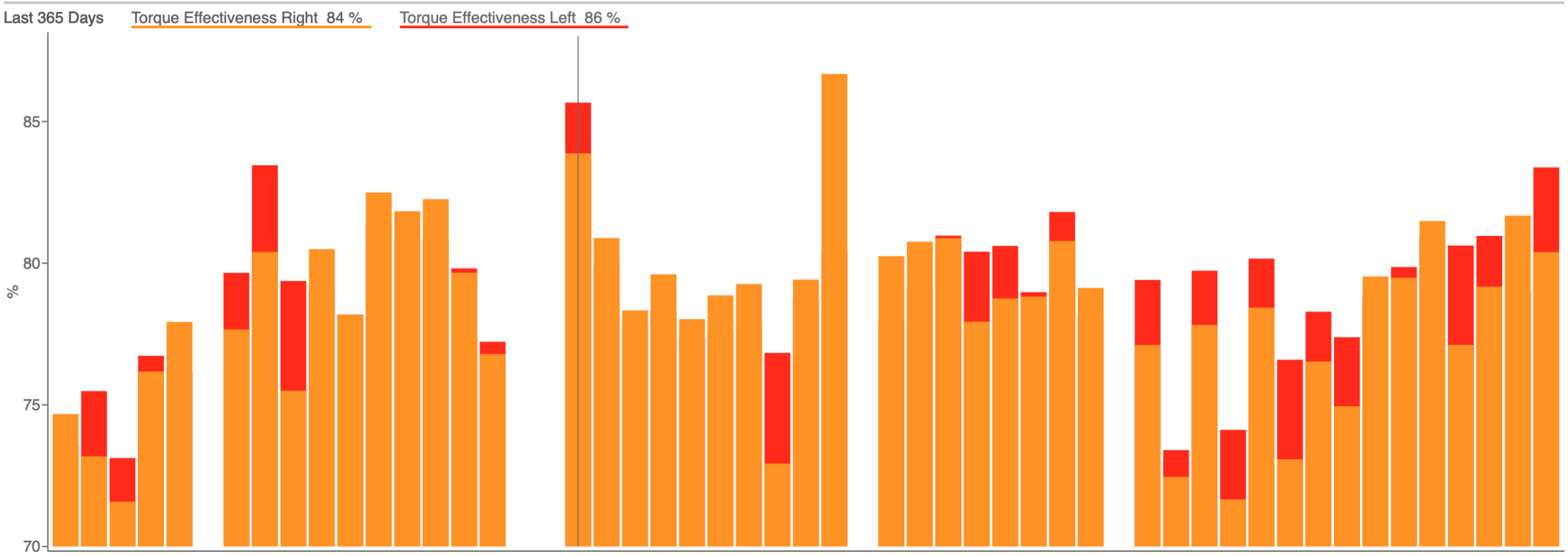




Mechanical efficiency: Constraints


Medium Mech eff vs CQ ranking
70
72
74
76
78
80
82
84
86
88
0
50
100
150
200
250
300
350
400
450

Mechanical effectiveness: season follow up



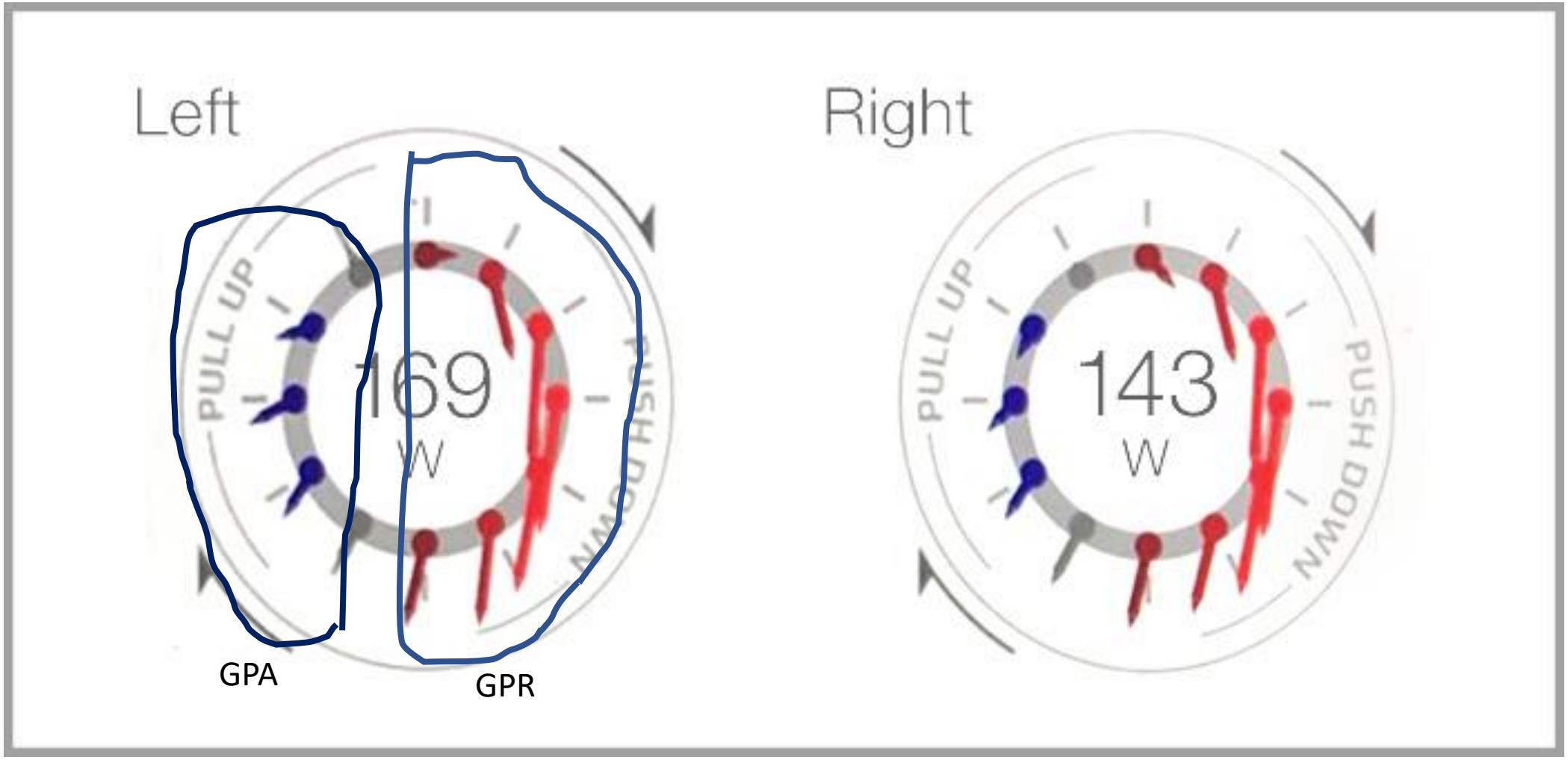
GPR-GPA ratio

Review

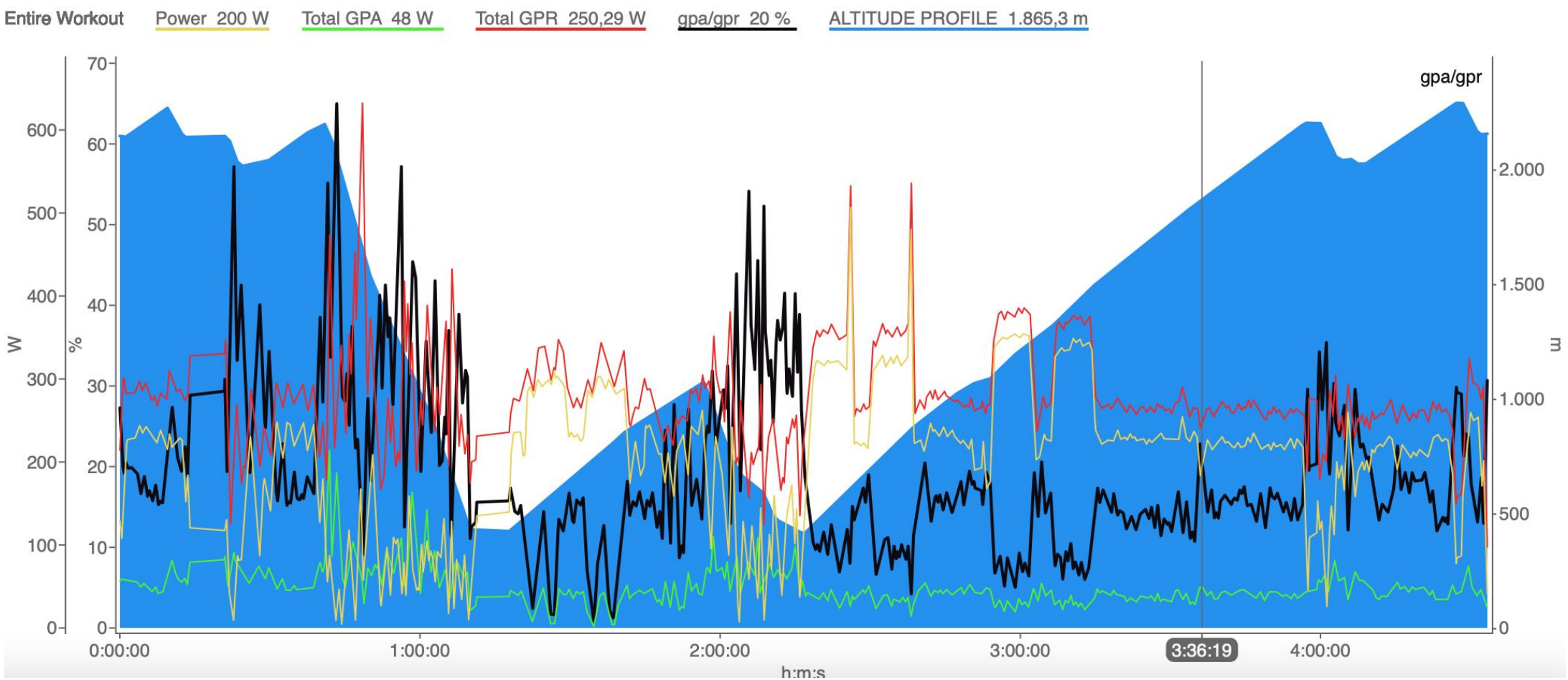
Cycling Biomechanics and Its Relationship to Performance

Nicolas A. Turpin [1,*] and Bruno Watier [2]

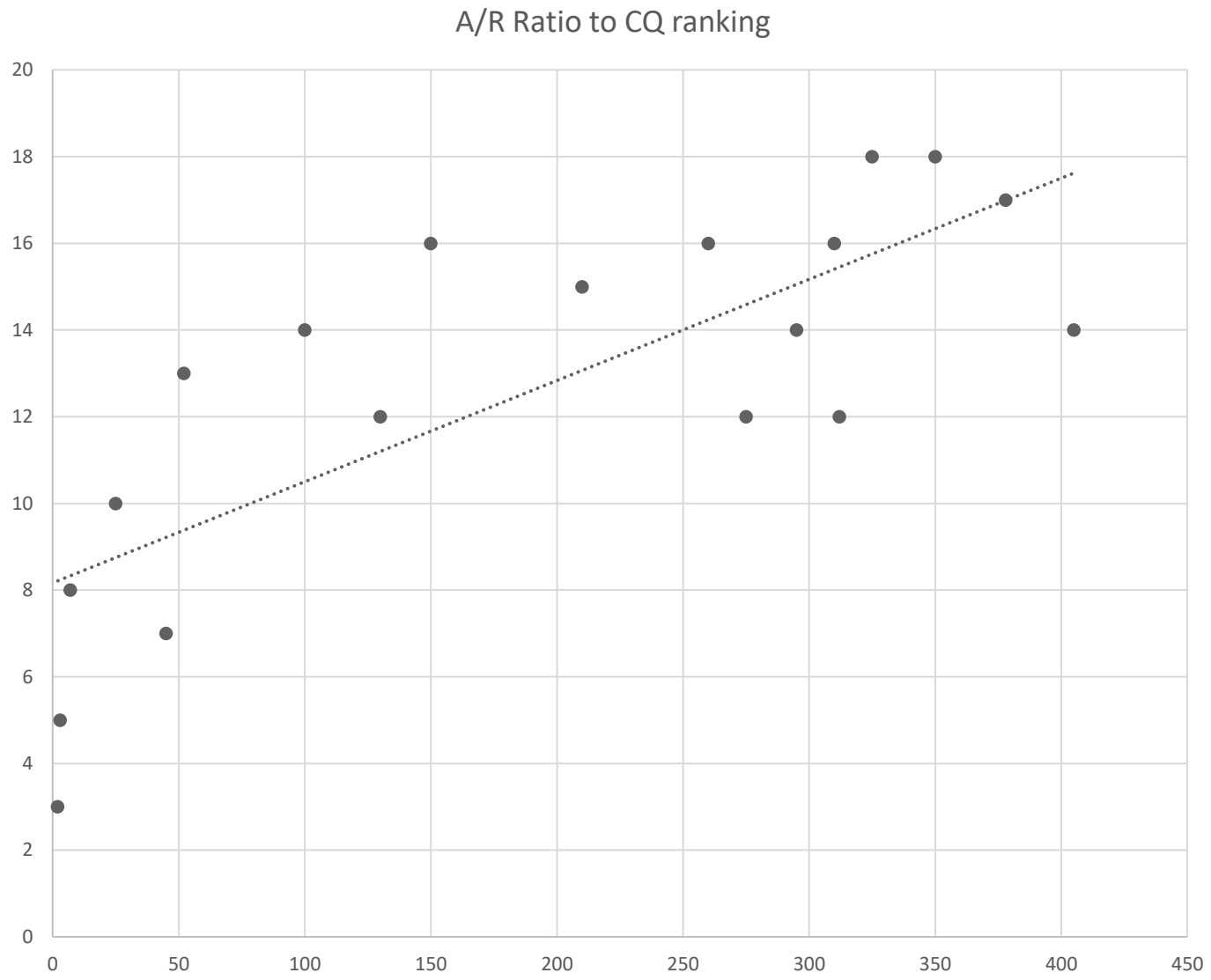
RATIO: Power Released / Power Absorbed



Absorbed/Relased power index (GRA/GPR)



Absorbed/Relased power index (GRA/GPR)



Max/min torque and metabolic efficiency (Jobson 2009)

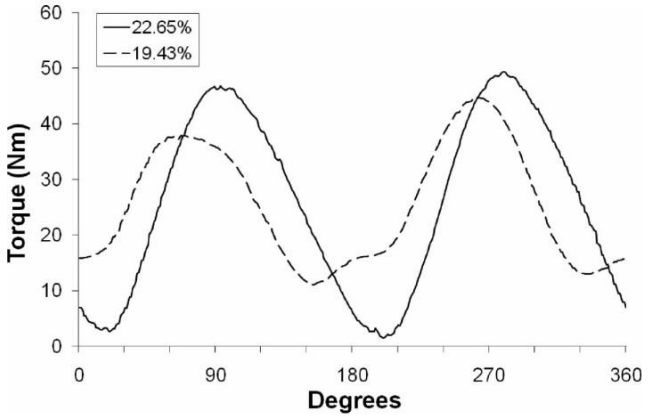
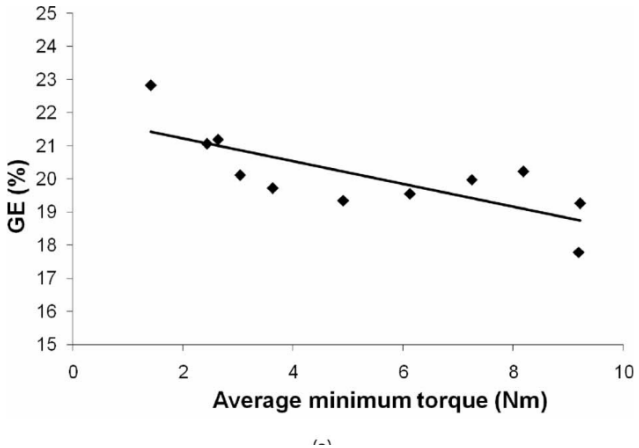
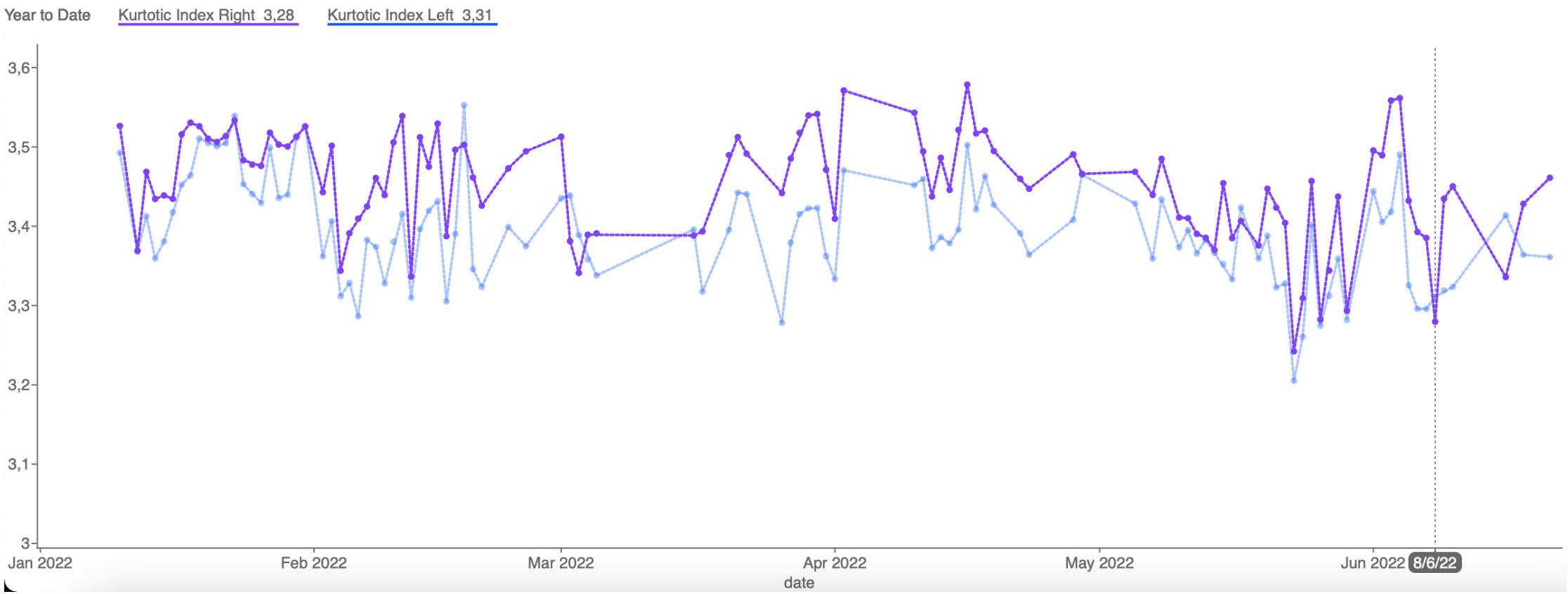


Figure 3. Mean torque data from 6 min at 250 W. These are the participants with the highest and lowest ranges of torque at this work rate.



Kurtothic index



Torque & Gross metabolic efficiency (Camara, 2012)

More medium torque, more efficiency.

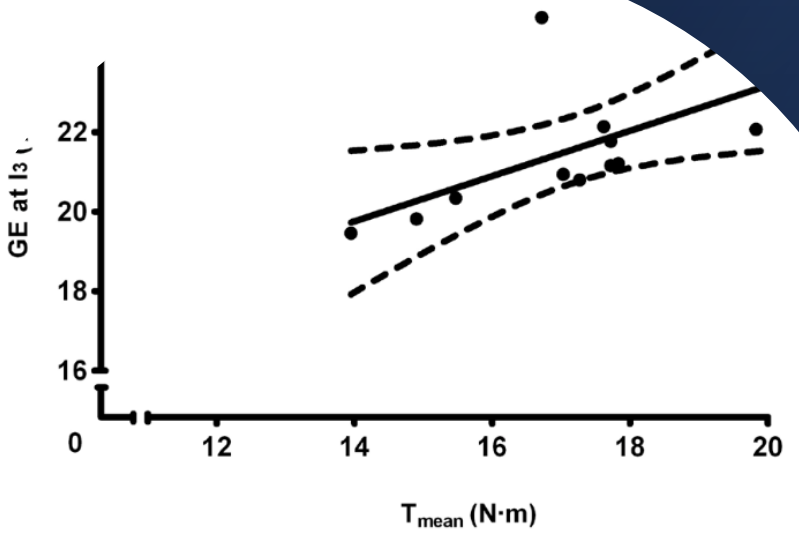


FIG. 5. DATA ILLUSTRATING THE RELATIONSHIP BETWEEN THE TMEAN AND THE GE AT THE EXERCISE INTENSITY AT WHICH THE OBLA WAS PRODUCED (I3)

egend: Linear regression is represented by a solid black line, ± 95
nfidence interval is represented by dashed lines. There is a posit
lation between the two variables (r = 0.63, p < 0.05). The fo
ng the relationship is y = 0.569x + 11.781; R2 = 0.396
propulsive and resistive torque; GE, gross efficiency; O
accumulation; I3, power output at which

The next challenge: Tangential forces & Radial Forces

Performace and asymmetries

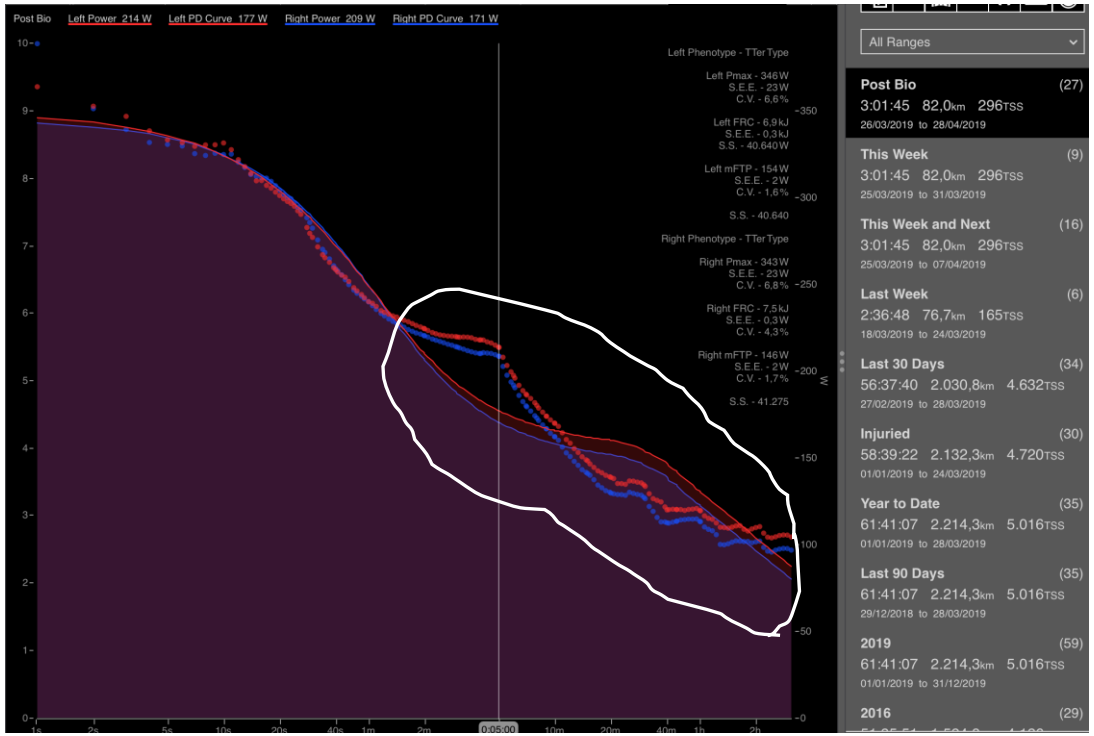
J Sports Med Phys Fitness. 2015 Sep;55(9):892-8.

Relationship between pedal force asymmetry and performance in cycling time trial

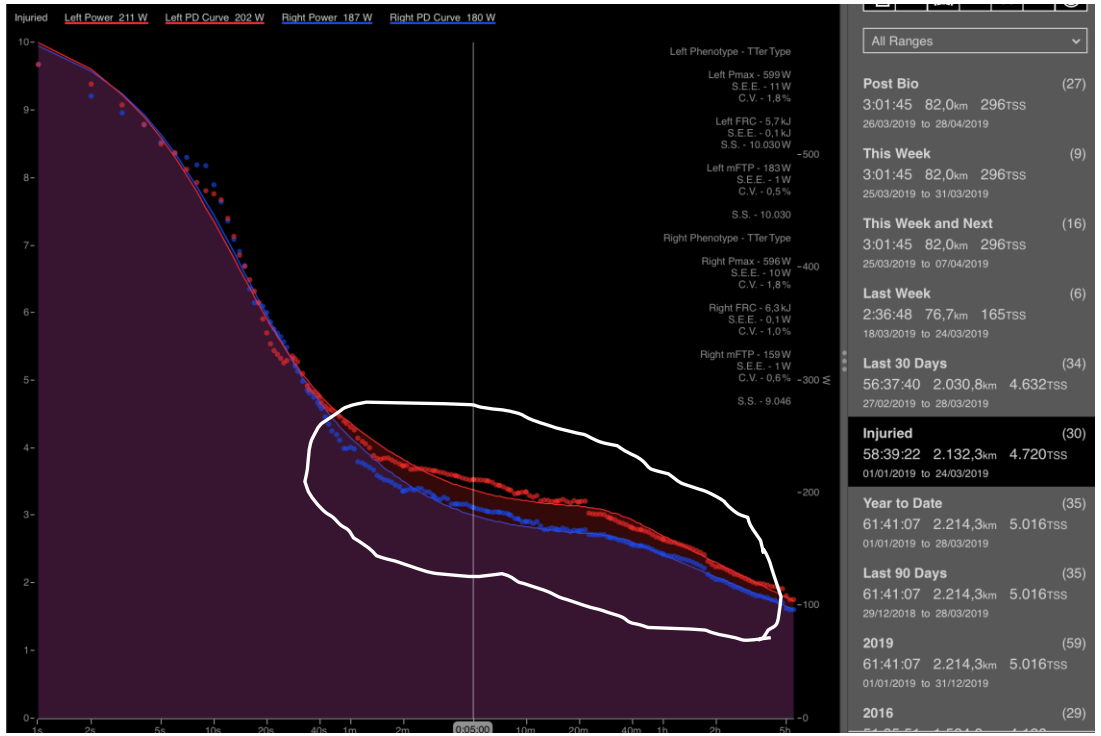
Real view of asymmetry

Performance changes

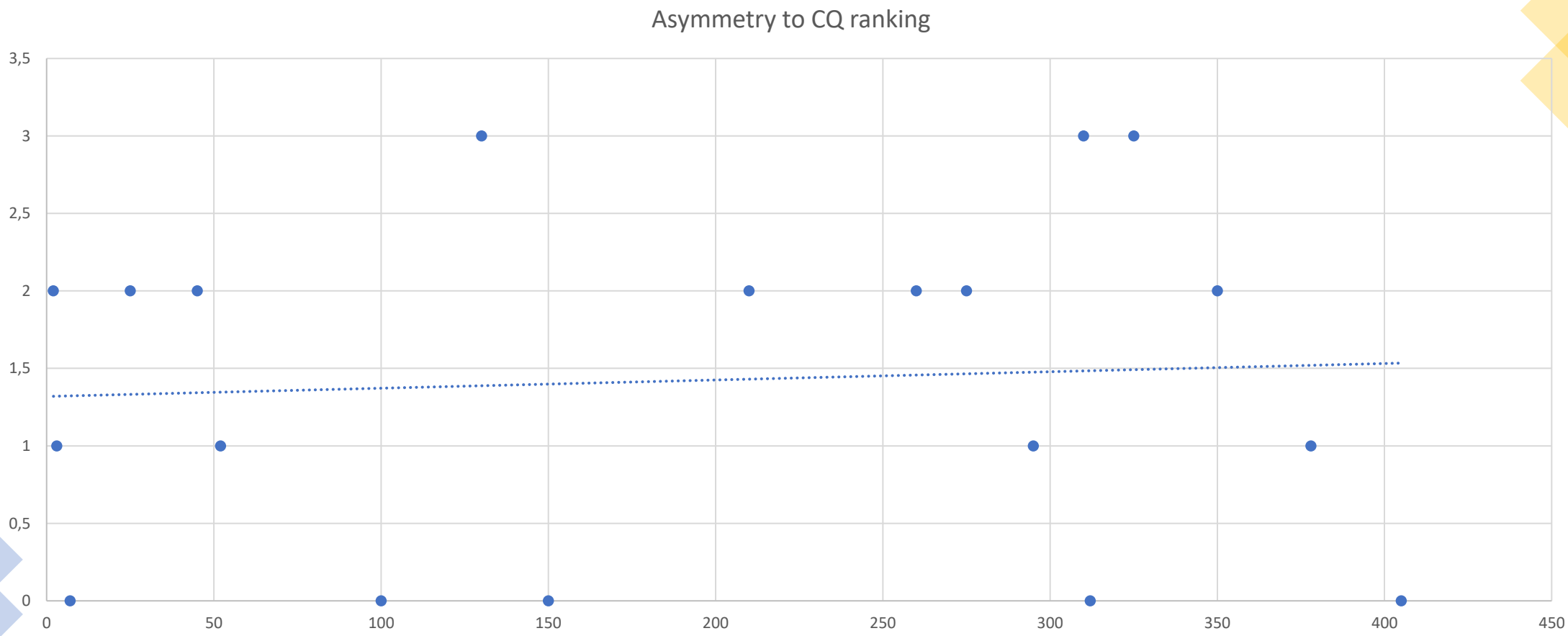
BALANCED: L 211 + R 187 watts 5´max



ASYMMETRIC: L 214 + R 209 watts 5’ max



Asymmetry and performance




Thankyou