TRAININGPEAKS™
RESULTS START HERE

INTRODUCTION TO POWER METRICS

Training and Analysis

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“That which is measured improves.”

Overview

- Part 1: Advanced Metrics
- Part 2: Power-Based Planning
- Part 3: Analyzing Session Power Data


Part 1: Advanced Metrics

Part 1

Metric: Functional Threshold Power (FTP)

- How are power zones set?
- FTP Similar to Lactate/Anaerobic Threshold
- Most Important Metric.

Part 1

Determining FTP

- 20-Minute Time Trial
- Other Methods
- Data Points.

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Part 1

Setting Power Zones

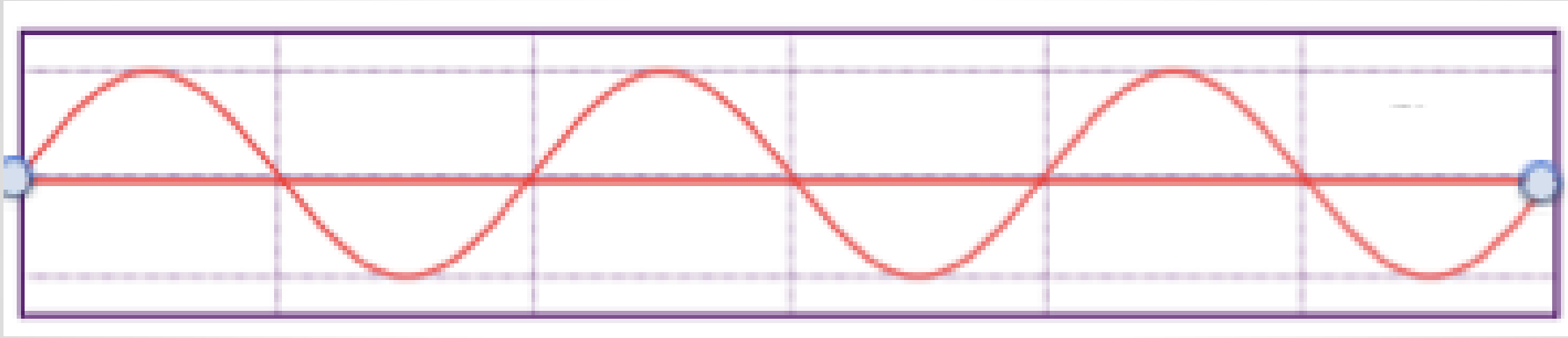
Power Zones Based on Percentage of FTP (*Training and Racing With a Power Meter*, Allen & Coggan)

Zone	Name	%FTP
1	Active recovery	<0.56
2	Aerobic endurance	0.56-0.75
3	Tempo	0. 76-0.90
4	Lactate threshold	0.91-1.05
5	VO_2max	1.06-1.20
6	Anaerobic capacity	1.21-1.50
7	Neuromuscular power	>1.50

Part 1

Metric: Normalized Power (NP)

- Average Power (AP)



- Same Average Power
- What was the *metabolic cost* of the ride?
- Normalized Power (NP)
- NP Emphasizes Surges.

Part 1

Metric: Variability Index (VI)

- How steady/non-steady was the ride?

Very Steady
(low variability)

Non-steady
(high variability)

TT Century rides MTB races Road races Crits.

Part 1

Metric: Variability Index (VI)

- A Comparison of NP and AP

  VI = NP ÷ AP

  VI = 1.0 = very steady

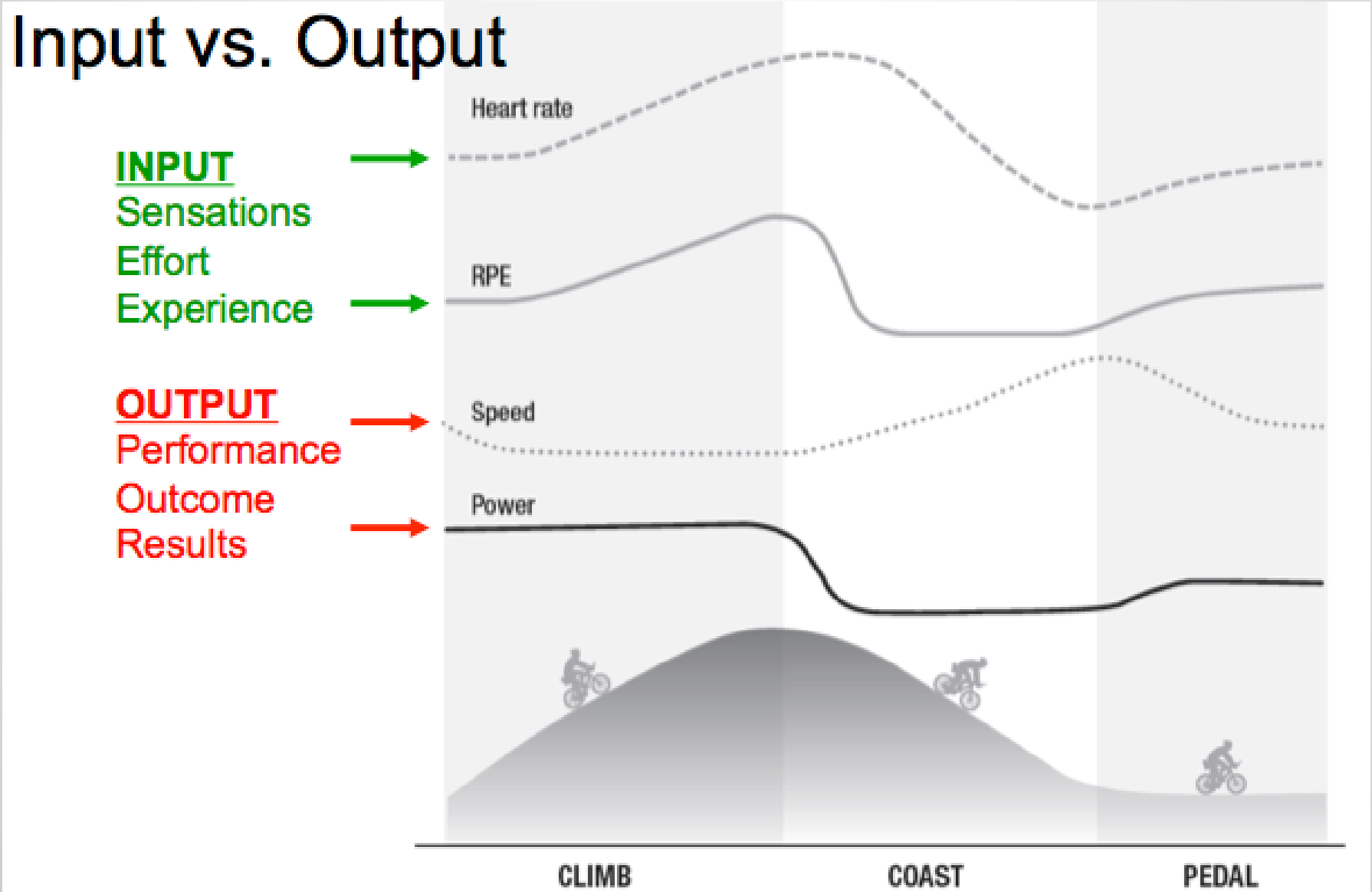
  VI > 1.0 = decreasing steady/increasing non-steady.

Part 1

Metric: Intensity Factor (IF)

- How intense was the ride?
  - Compare NP and FTP
  - NP ÷ FTP = IF
  - Example: 188w ÷ 250w = 0.75.

Metric: Efficiency Factor (EF)



Part 1

Metric: Efficiency Factor (EF)

- Output ÷ Input = Efficiency

"The degree to which something is done well or without wasted energy."

Part 1

Metric: Efficiency Factor (EF)

- How aerobically fit is the rider?

  Output Greater at Same Input = More Fit

  Input Lower at Same Output = More Fit

- NP ÷ HR = “Efficiency Factor” (EF)
- *NOTE: HR & Environment.*

Part 1

Metric: Efficiency Factor (EF)

- Cycling EF Example (same aerobic workout)

  Ride #1:

  190w (NP) ÷ 125 bpm (avg) = 1.52 EF

  Ride #2 (x days later):

  200w (NP) ÷ 122 bpm (avg) = 1.64 EF

  EF Improvement = 8%

Efficiency Factor (EF) Analysis

- Power example: AeT (aerobic threshold) steady state (2h+ @ low z2 HR)

Nov 23	1.63	
Nov 30	1.65	
Dec 7	1.69	
Dec 14	1.67	
Dec 21	1.72	
Dec 28	1.75	
Jan 4	1.70	
Jan 11	1.87	
Jan 18	1.85	
Jan 25	1.86	Plateau +15%

Part 1

Metric: Pw:HR (Decoupling)

- How was the rider's aerobic fitness *today*?
  - Rate of fatigue
  - Compares NP & HR
  - (NPh1/HRh1) – (NPh2/HRh2) / (NPh1/HRh1)
  - Goal: <5% decoupling (aerobic)
  - *NOTE: HR & Environment.*

Part 1

Pw:HR (Decoupling) Analysis

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4% Decoupling

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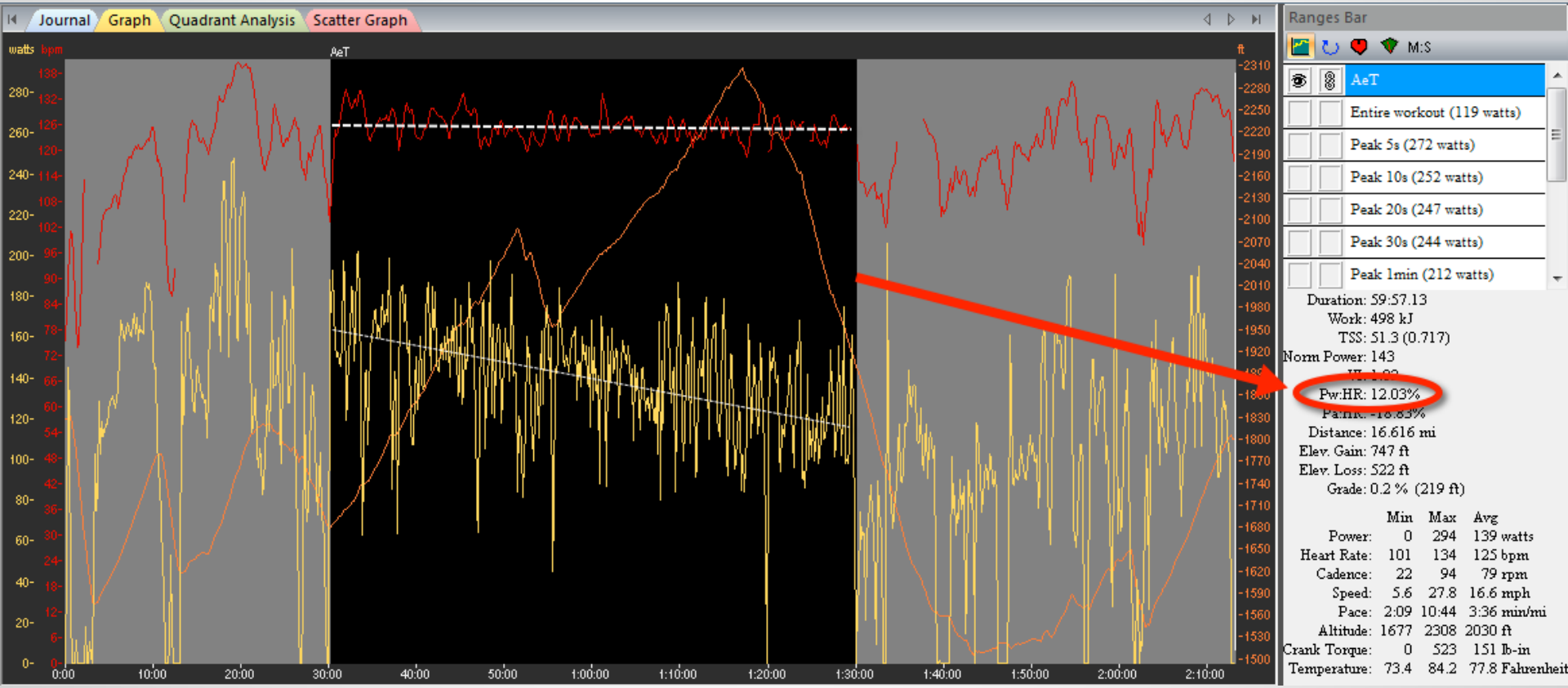
Part 1

Pw:HR (Decoupling) Analysis

WKO+



12% Decoupling

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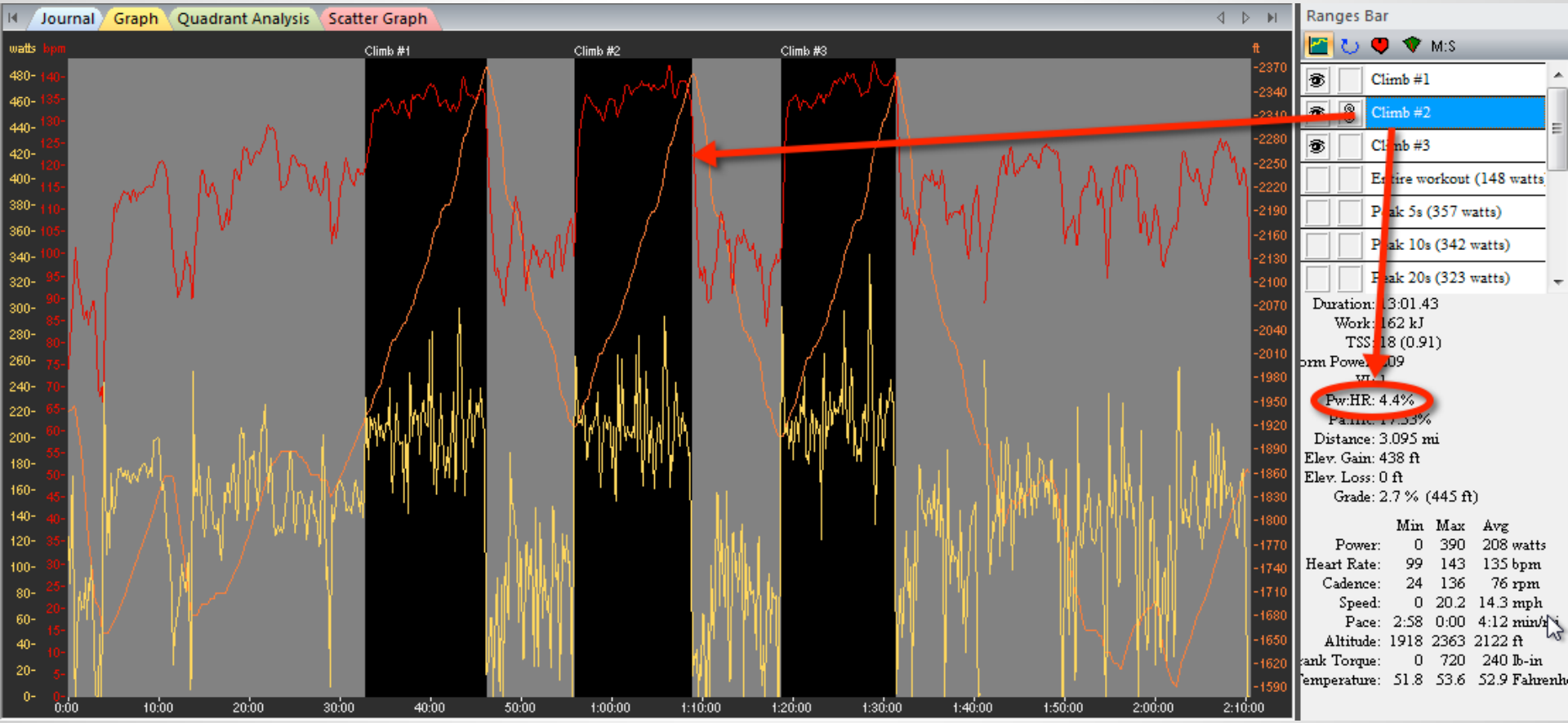
Part 1

Pw:HR (Decoupling) Analysis

Decoupling - Intervals



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Part 2: Power-Based Planning

Part 2

Training Stress Score (TSS)

- Training Is Stress (Hans Selye, Genl Adapt Synd)
- Duration x Intensity (& Rest)

- How is training stress measured?

Part 2

How TSS Is Calculated

- Duration & Intensity

(sec x NP x IF) ÷ (FTP x 3600) x 100 = TSS

- Example for 2-hour Ride at 188w NP:

(7200 x 188 x 0.75) ÷ (250 x 3600)x100 =112.8

-OR-

- IF^2 x Hours x 100 = TSS

(0.75 x 0.75) x 2 = 112.5

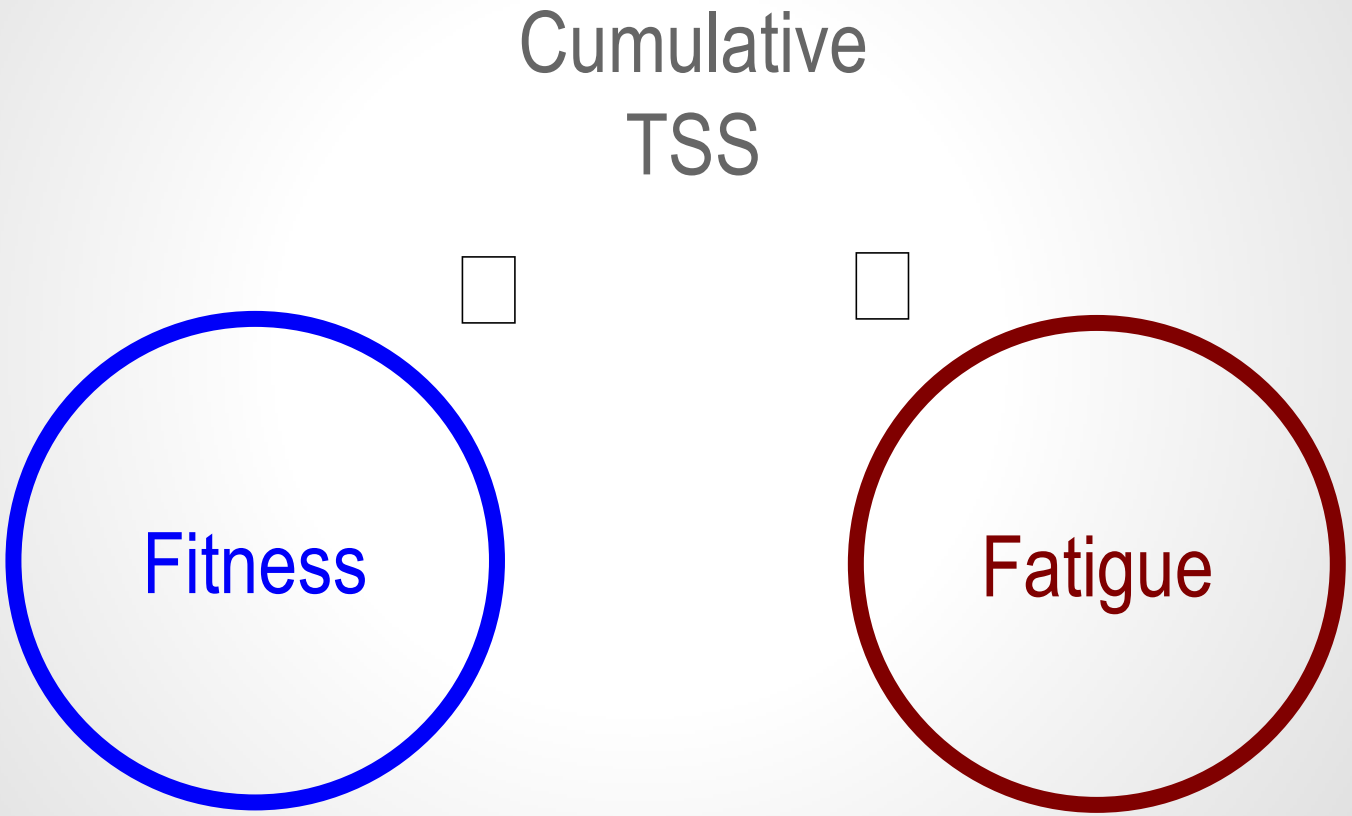
Part 2

Periodization and TSS

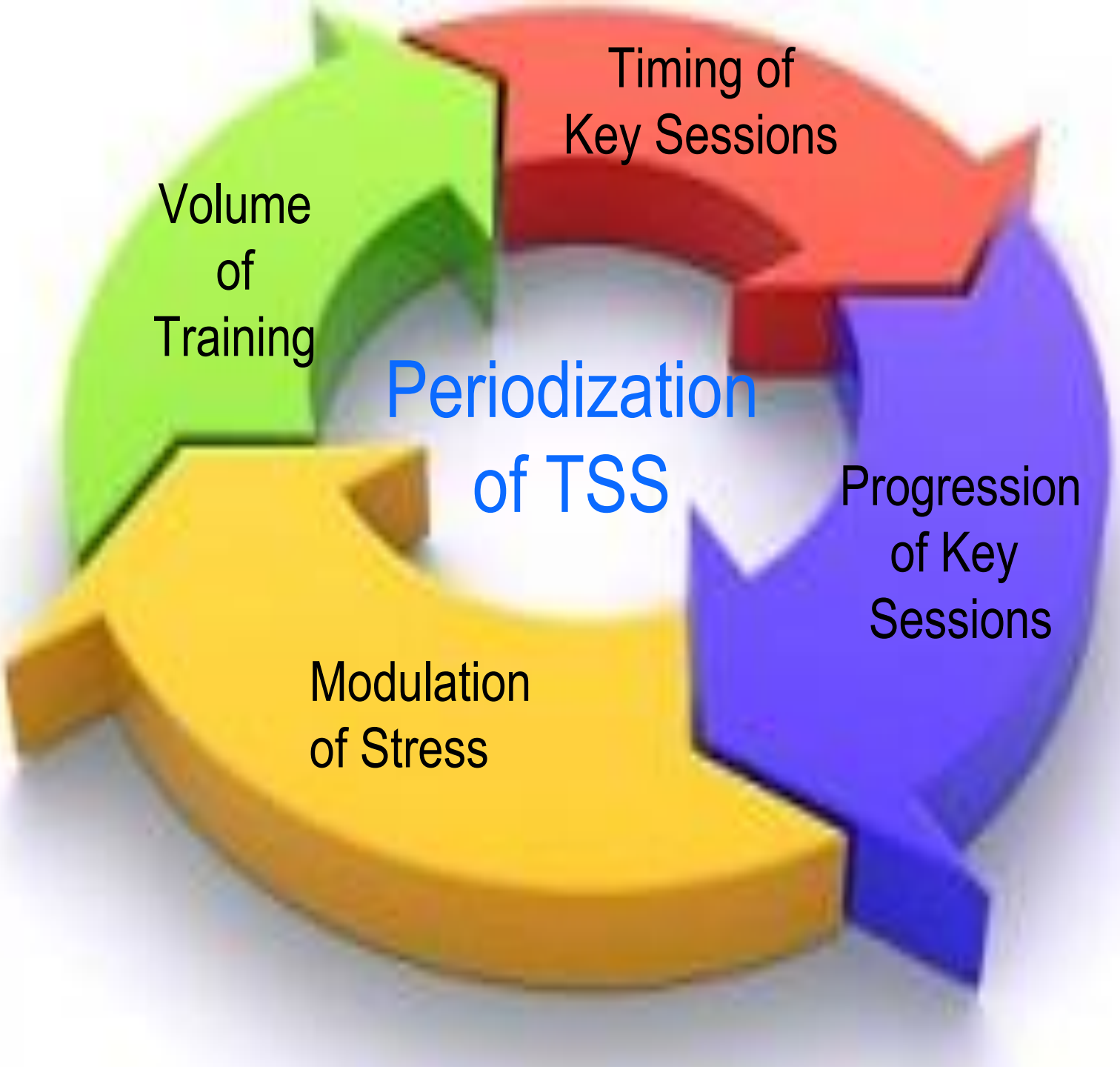
- Cumulative TSS
  - -Related to Fitness
  - -Related to Fatigue.

Part 2

Periodization and TSS



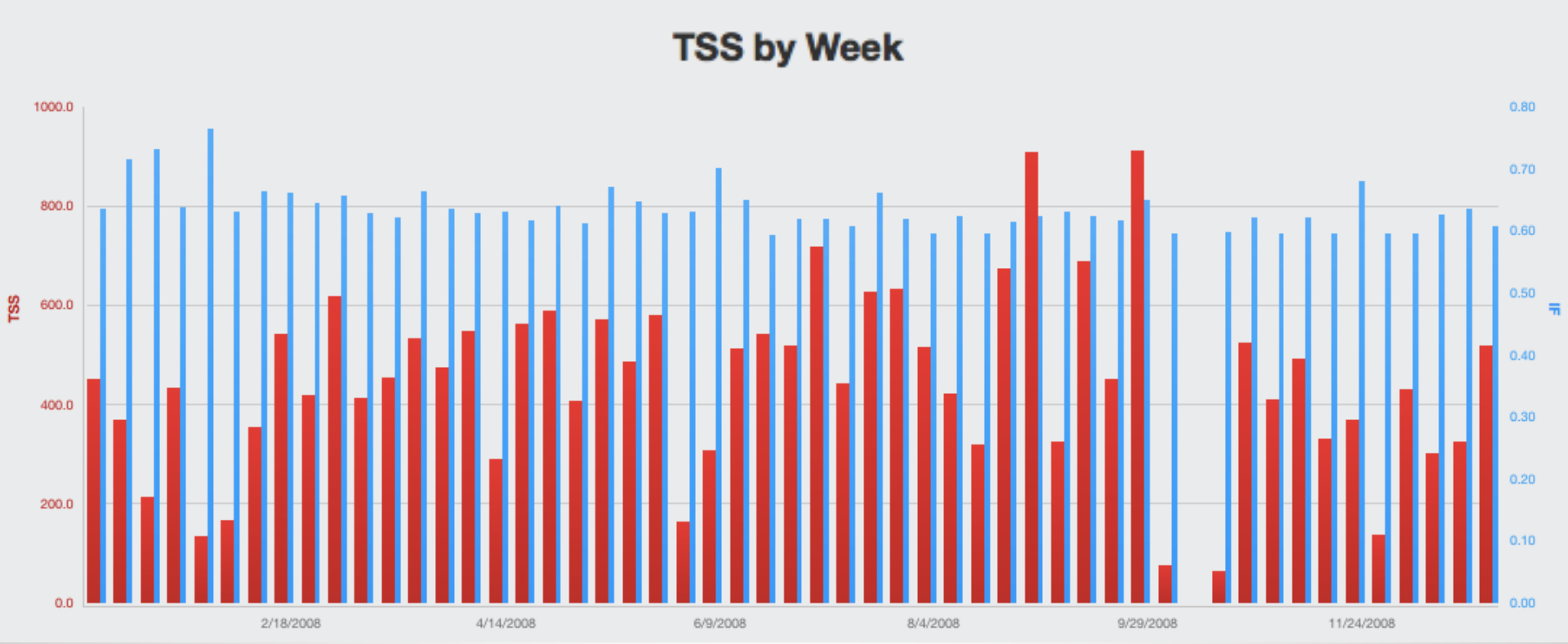
Part 2


Timing of
Key Sessions
Volume
of
Training
Periodization
of TSS
Progression
of Key
Sessions
Modulation
of Stress

Part 2

Periodization and TSS

Macrocycles & TSS



Part 2

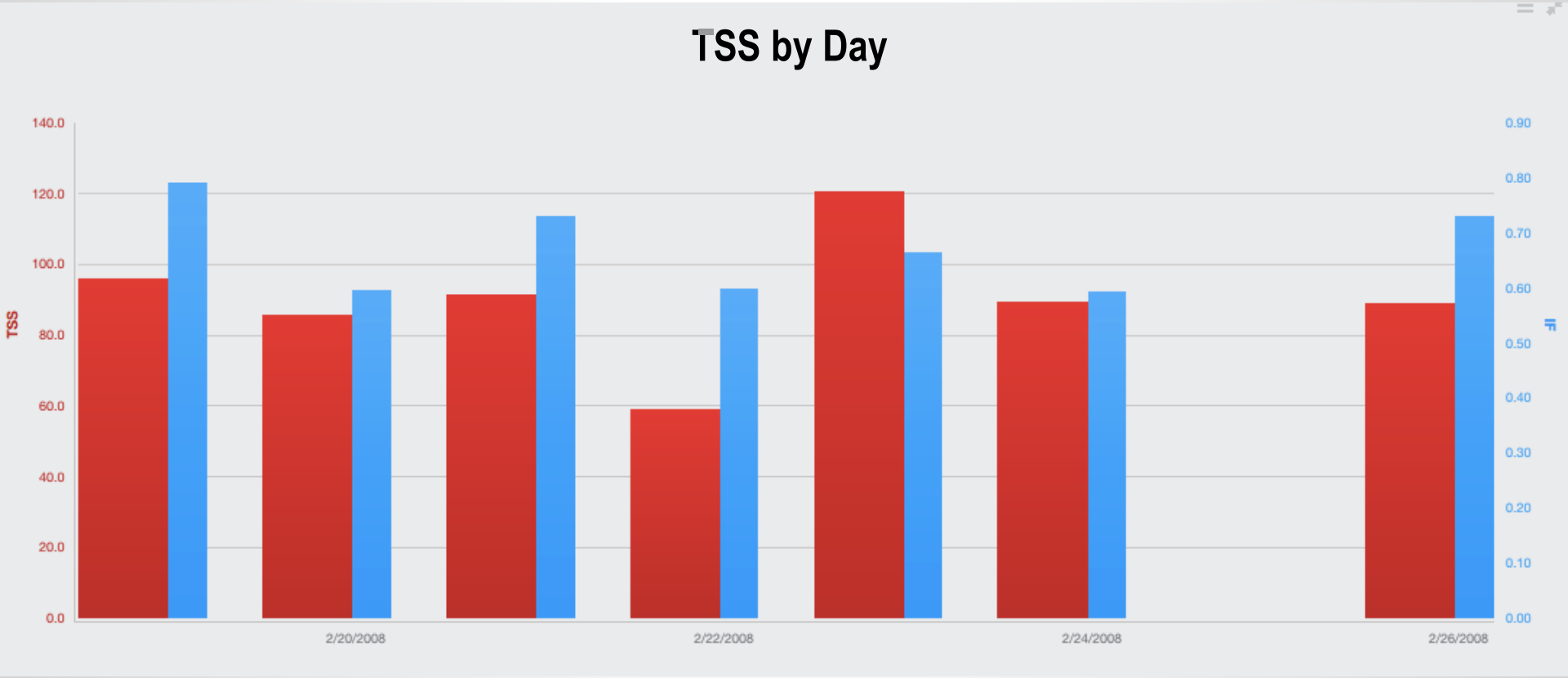
Periodization and TSS

- Microcycles
  - -TSS Dose
  - -TSS Density.

Part 2

Periodization and TSS

Microcycles & TSS



Part 2

Periodization and TSS

- Designing a Workout
  - Step 1: Determine TSS
  - Step 2: Determine IF
  - Step 3: Calculate Duration.

Part 2

Periodization and TSS

- Calculating Workout Duration

$$Dur = TSS \div (IF^2 \times 100)$$

$$Dur = 150 \div (0.70^2 \times 100)$$

$$Dur = 150 \div (0.490 \times 100)$$

$$Dur = 150 \div 49$$

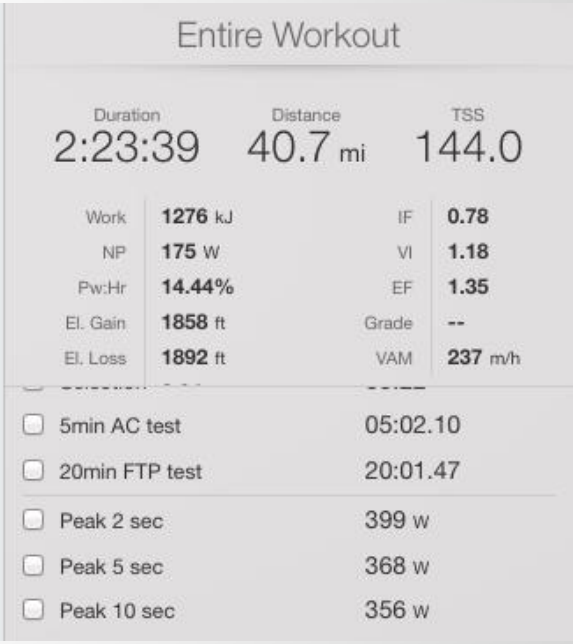
$$Dur = 3.06 \text{ hours.}$$

Part 3:
Analyzing Session Power Data

Part 3

Analyzing a Session

TrainingPeaks.com



Part 3

Analyzing a Session

TrainingPeaks.com

ADVANCED POWER METRICS

Power Resources

Websites

- Analyticcycling.com
- Groups.google.com/group/wattage
- Joefrielsblog.com
- Trainingandracingwithapowermeter.com
- Trainwithpower.net

Books

- The Power Meter Handbook (Friel)
- The Triathlete's Guide to Training With Power (Skiba)
- Training and Racing With a Power Meter (Allen & Coggan)
- Watts per Kilogram (Wharton)

Thank You!

USA Cycling

Kevin Dessart

Coaches

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