



Triathlon Training

Understanding and training the correct energy systems

Outline of topics

- There are different muscle fiber types
- Understand the different energy systems
- Changes to Aerobic Training
- How your body creates fuel and deals with waste
- Energy systems and Training Zones
- Endurance vs Performance
- Periodization



Muscle Fiber Types

Slow Twitch - Type I

- Oxidative
- Holds mitochondria
- Fatigue resistant
- Can use fat, sugar, lactate for fuel
- Slow access to fuel

- [Which energy system?](#)

Fast Twitch – Type IIB Fast Glycolytic

- Anaerobic
- Almost no mitochondria
- Very powerful
- Fatigues quickly
- Fast access to fuel

Fast Twitch – Type IIA Slow Glycolytic

- Oxidative
- Glycolytic
- VO₂ efforts
- Can convert to act like Type I
- Moderate access to fuel

Energy Systems

Aerobic

Fatigue Resistant, endurance

Activities that continuously last longer than 2 minutes

- Walking
- Low intensity exercise (running and biking)

Anaerobic

Power producing,

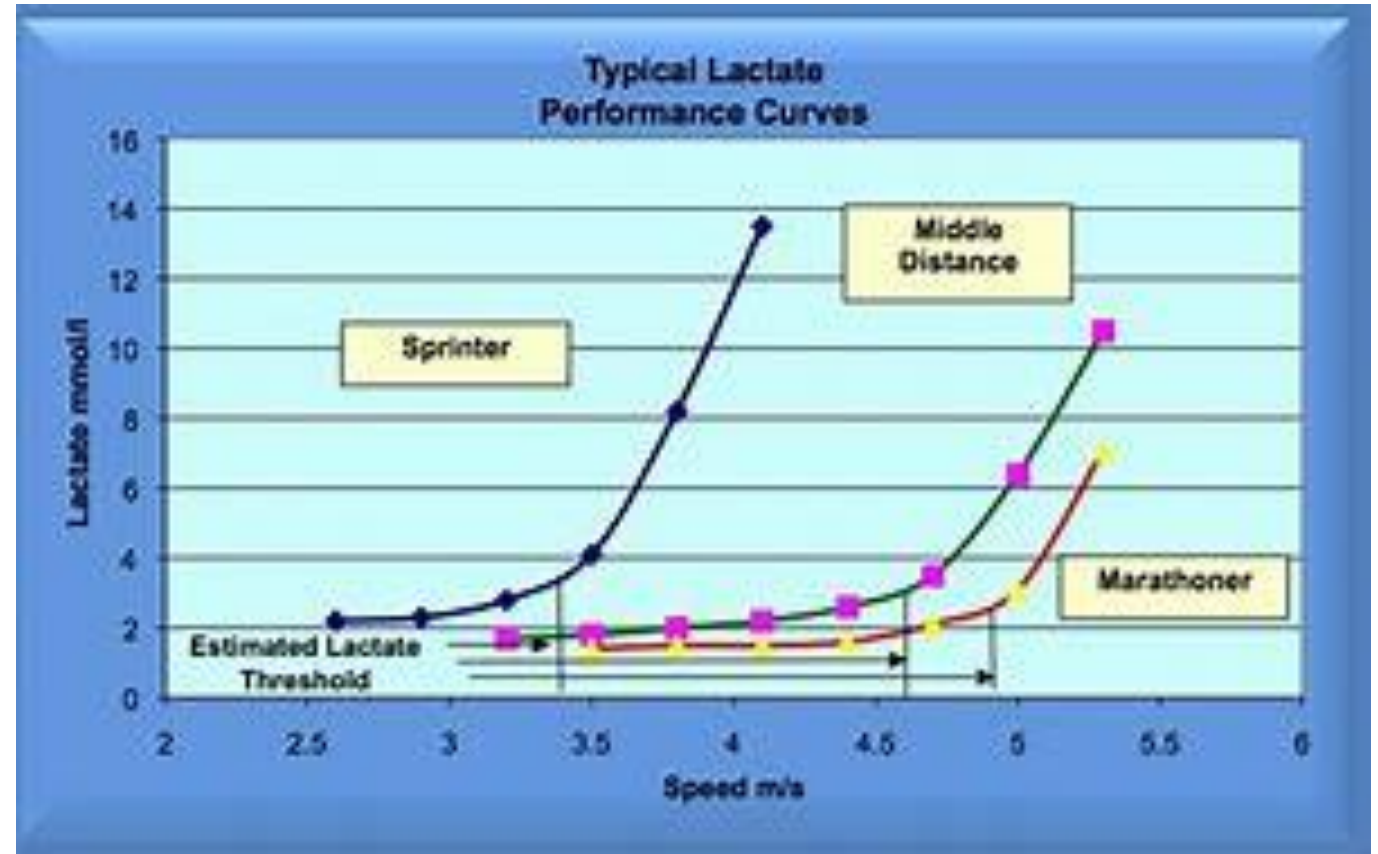
Activities lasting from 9 seconds to 6 minutes

- 800 meter race
- Crossfit
- Shoveling snow

Alactate

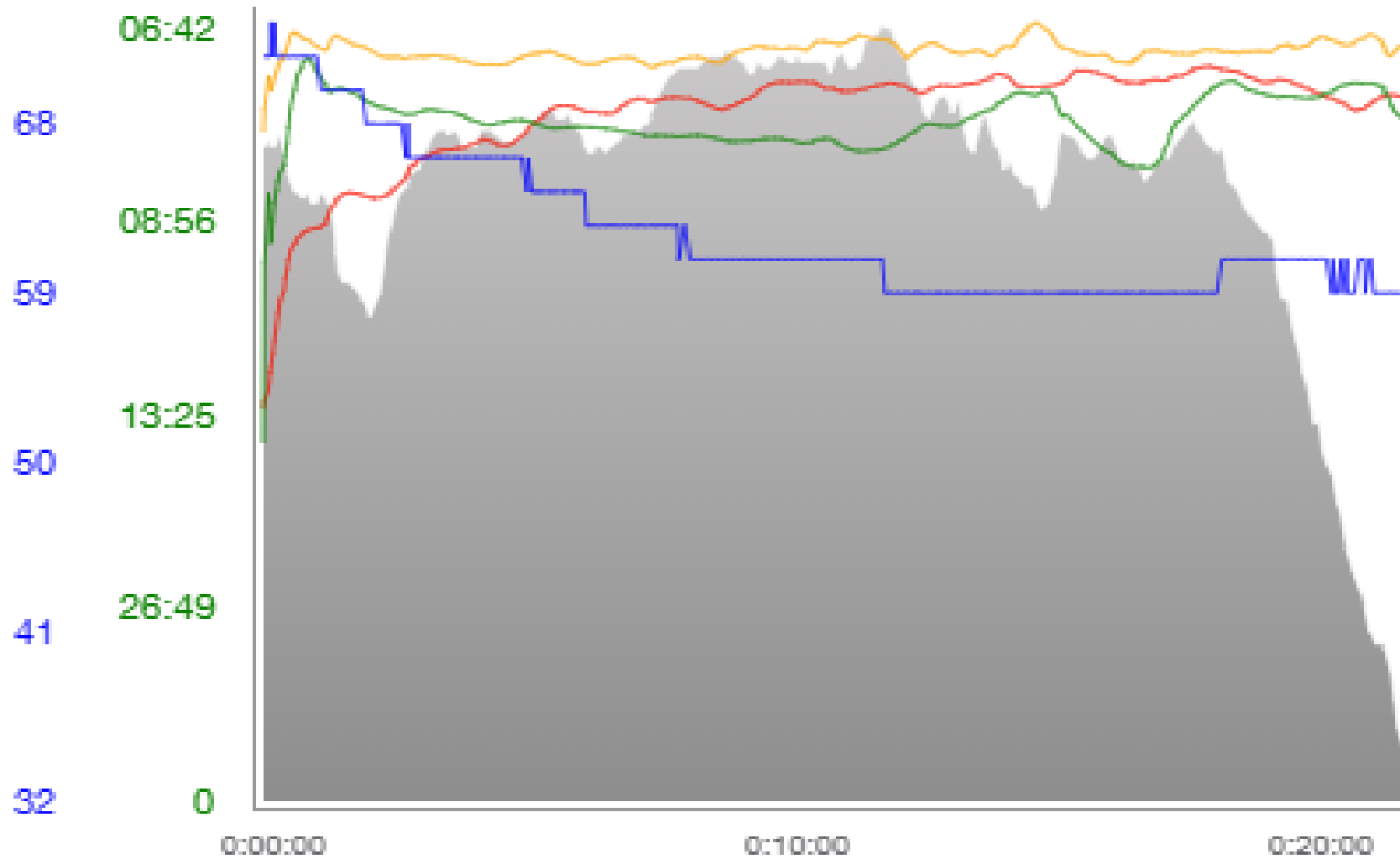
Activities that that last between 1-8 seconds

- Sprinting

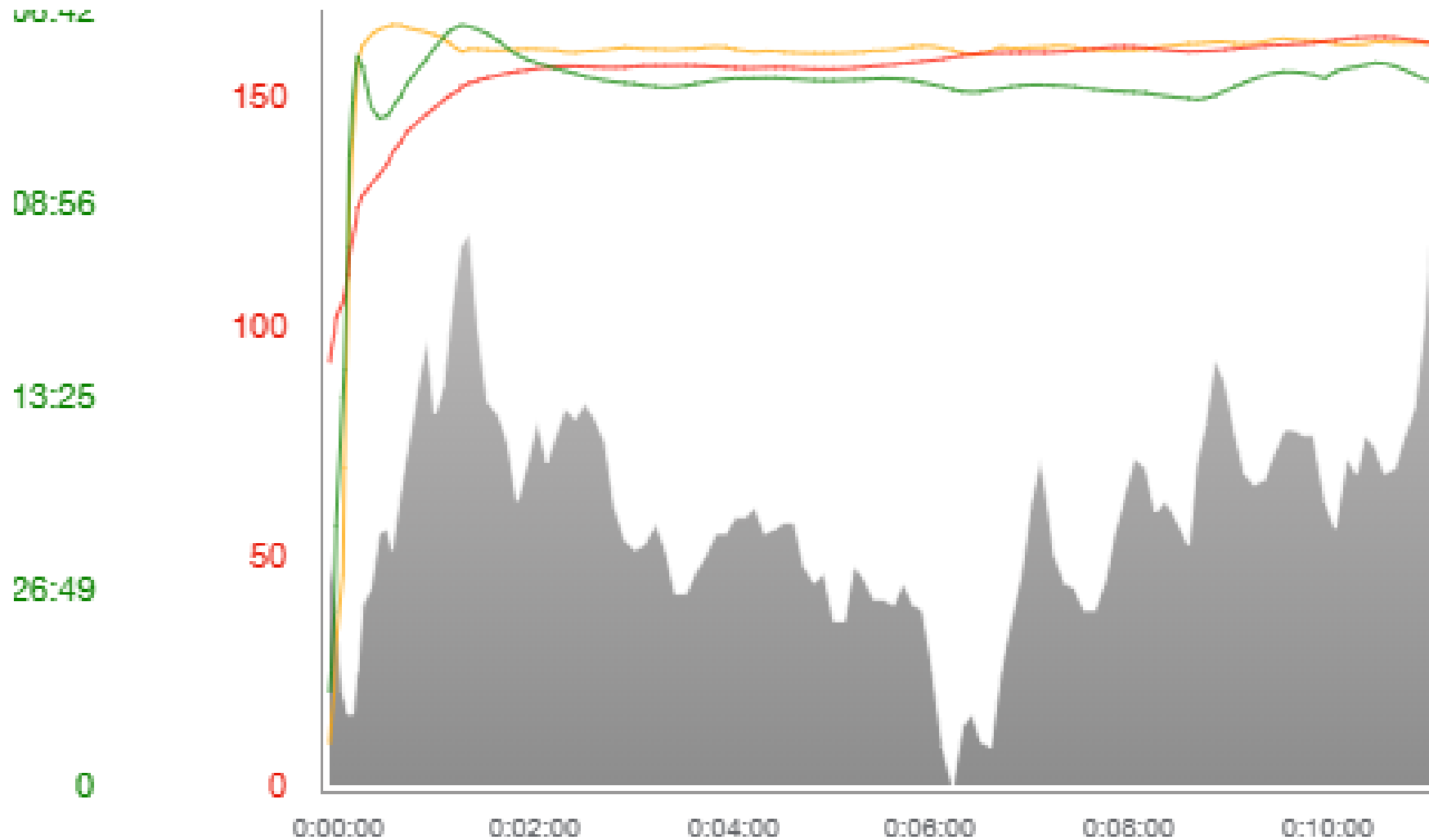


Lactate.com

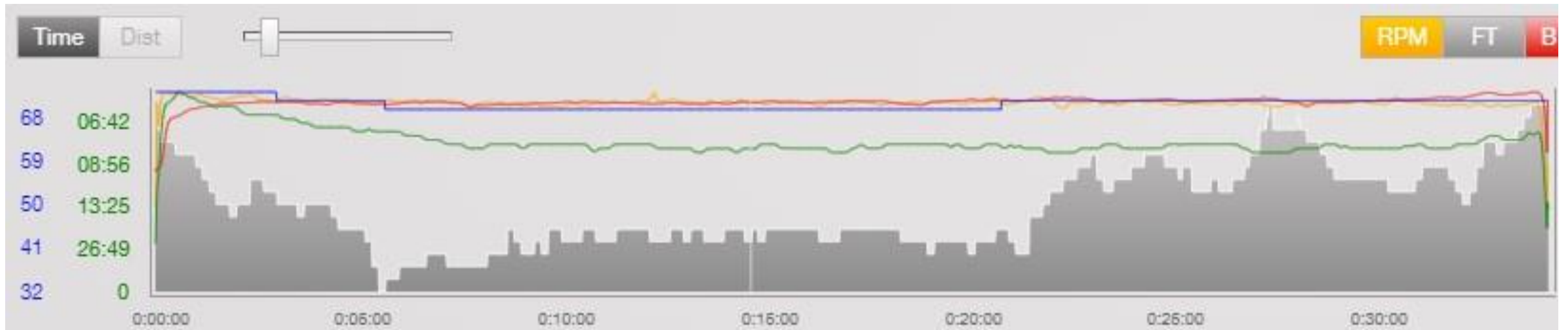
Energy Systems Case Studie #1



Energy System Case Study #2



Energy System Case Study #3



Energy system Case Study #4



Changes due to Metabolic Aerobic Training

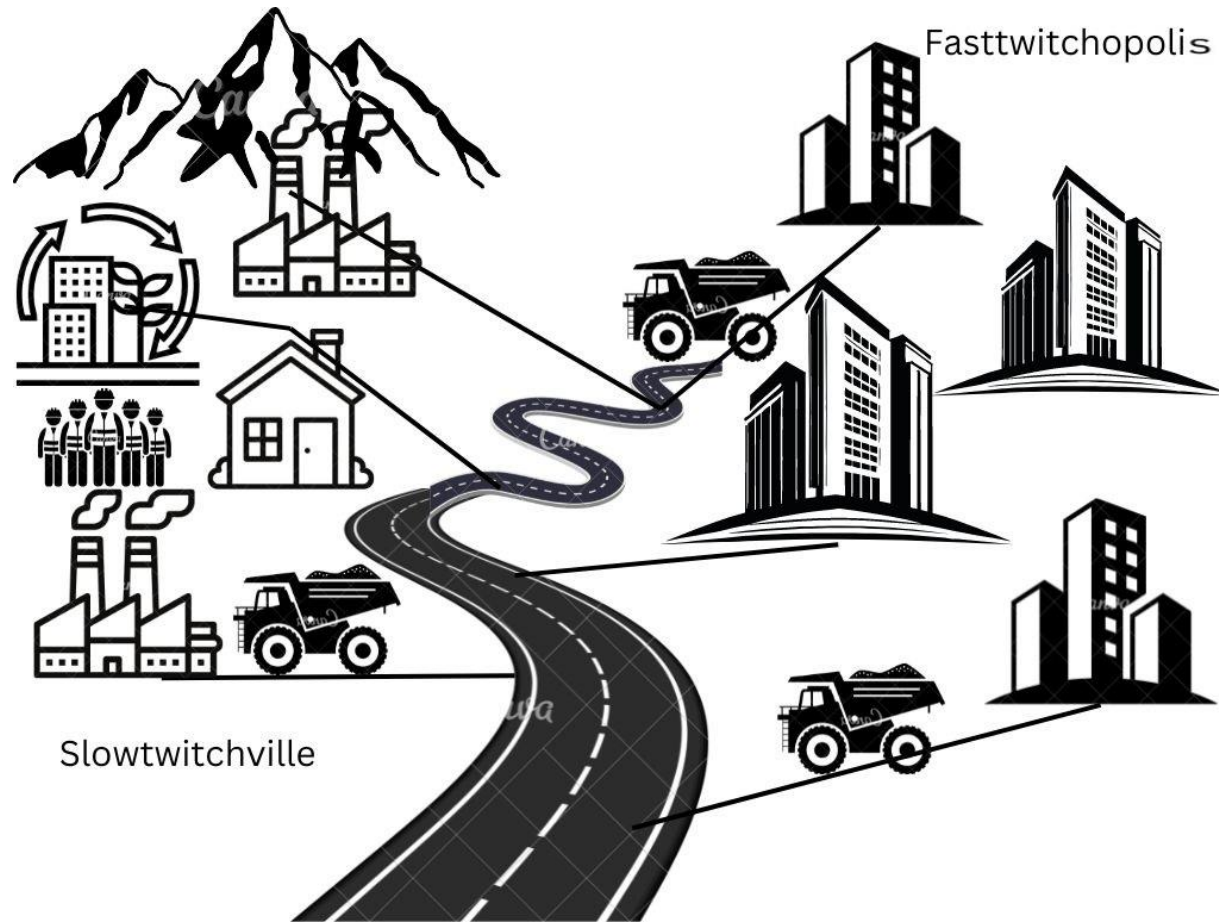
All the following will increase:

- heart size and stroke volume
- blood volume
- the number and size of mitochondria
- Artery diameter
- Capillary density
- Enzymes and transporter proteins (MCT1, GLUT4, catecholamines)
- Onset of blood lactate accumulation shifts right
- Stronger slowtwitch muscle fibers (Type 1 and Type 2a)

Fuel Sources

- ATP is the basic unit of useable energy for the body. It is produced by converting the different substrates into ATP. Adenosine TriPhosphate
- Glucose
 - Short term anaerobic yields 2 ATP
 - Long Term Oxidative Krebs cycle yields 36 ATP
- Fatty acids
 - Oxidative Krebs cycle yields 130 ATP
- Lactate (produced as an anaerobic waste product and used as an aerobic fuel)
- Protein
- Alanine, Glycerol, Ketones

Flow Model – Tale of Two Cities



Slowwitchville

- Uses resources from Fat Mountain for abundant energy.
- Recycles
- Slow relaxed lifestyle
- Will use the waste from Fasttwitchopolis for fuel

Fasttwitchopolis

- Gets resources from Sugar Hwy
- Fast paced lifestyle creates lots of trash
- Ships waste to Slowwitchville
- Trash often builds up when the Sanitation Dept can't keep up

Training Zones

Zone	RPE	Length in time	Race type
Zone 1 Recovery	1-3 Chill	All day	Ultra marathon
Zone 2 Aerobic Zone 3 (2B) Aerobic Max	4-6 Relaxed Challenging	2+ hours	marathon
Zone 4 Mixed Fiber	7-8 Focused Strong	1-2 hours	half marathon
Zone 5 Lactate Threshold Zone 5+ Threshold Max	9 Comfortably Hard Uncomfortably Possible	7 minutes-60 minutes	5k to 10k
Zone 6 VO2	10 Final Push	60 seconds -6 minutes	800 meters – 1 mile
Zone 7 Maximum	10+ Done	Under 60 seconds	Sprint

Training Principles

- 80% of time aerobic fitness focused/20% anaerobic performance focused
- Some research puts Metabolic Aerobic time at 300 minutes/wk
- 10% increase of volume or intensity in any block
- Consistency is key. Many B+ workouts are more productive than a few A+ workouts.
- Racers are faster on race day slightly less trained than perfectly trained and on crutches.
- Strength training helps prevent injuries and helps performance.
- Genetic make-up determines rate of adaptation

Endurance vs Performance

Endurance

- Able to continue
- Efficient fuel use
- Limited top end
- Limited explosiveness

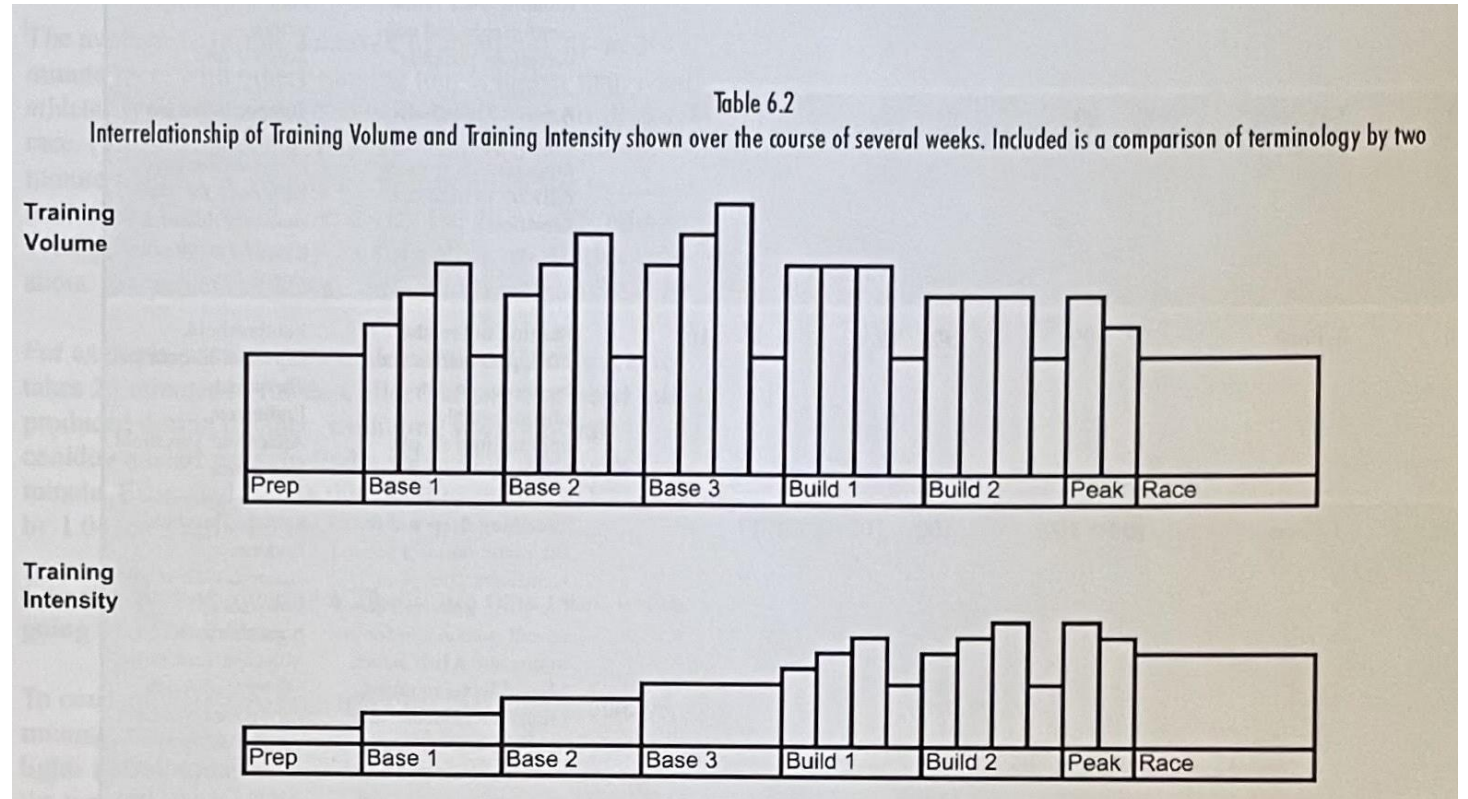
Performance

- Speed
- Being able to run a pace
- Stamina
- Strength
- Goal driven
- Limited duration

Endurance or Stamina?

Periodization

- The basic concept is having cycles of harder work and then cycles of recovery
- The body becomes fatigued from training
- The body becomes more fit through rest and recovery
- Basically, the body can be in a performance state or a recovery state.
 - It takes time to transition from one to the other.
- Most cycles are two weeks of training to one week of recovery.
 - Recovery can be active if it allows the body to repair.



Questions?

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Training Group

Broad Ripple home base

Tuesday, Thursday and Saturday runs

Wednesdays bike or brick

Swim Clinic: signup form

