



DISCOVER AND USE YOUR TRAINING ZONES FOR
OPTIMAL PERFORMANCE

Krista Schultz, MEd, CSCS



Web: enduranceworks.net

Krista's background and credentials

Personal and Athletic

- 6 siblings, family of athletes
- Division 1 Track & XC runner
- Triathlete
 - Qualified for Ironman Hawaii 3x (completed 2006, 11:30)
 - Competed in IM China 2008
 - Qualified & Competed in Triathlon & Duathlon Worlds 2002 & 2003
 - Qualified for Best of the US (completed 3x for MD, top 10 in 2006)
 - USAT All American

Professional

- Education:
 - BS, Exercise Physiology
 - MEd
- Certifications
 - USA Triathlon & Cycling
 - USA Weight Lifting
 - NSCA CSCS & CPT
- Strength & Conditioning Coach for 2 years, Towson University
- Performed VO₂max, blood lactate, resting metabolic rate, body composition, field testing & personal training for over 10 years

Goals

- Understand key training & fitness parameters
- Learn how knowing your lactate threshold can make training more efficient & effective
- Learn how to determine and use your heart rate & power training zones



"You wouldn't hunt without a weapon. So, why would you train without a heart rate monitor?"

- Lance Armstrong

Agenda

- Why should you test?
- What do the tests tell you?
- What are different types of tests or ways to determine workout intensity?
- How can you structure your workouts based on testing results to improve performance?
- What tests are appropriate for your level of experience & goals?

Why should you test?

- Help you understand where energy systems changes occur & what systems need to be developed for optimal performance
- Measure current fitness and monitor progress by testing periodically
- Improve training efficiency & effectiveness
- Prevent over-training
- It's motivating

To understand intensity and training zones, we first need to first understand where the body gets energy from

- The body breaks down ATP for energy

- Three energy systems in the body create ATP:

- Phosphocreatine: creatine phosphate

- Glycolytic system: carbohydrate only

- Oxidative system: fat, carbohydrate, protein

“Anaerobic” without O₂

“Aerobic” with O₂

- All 3 energy systems are always active

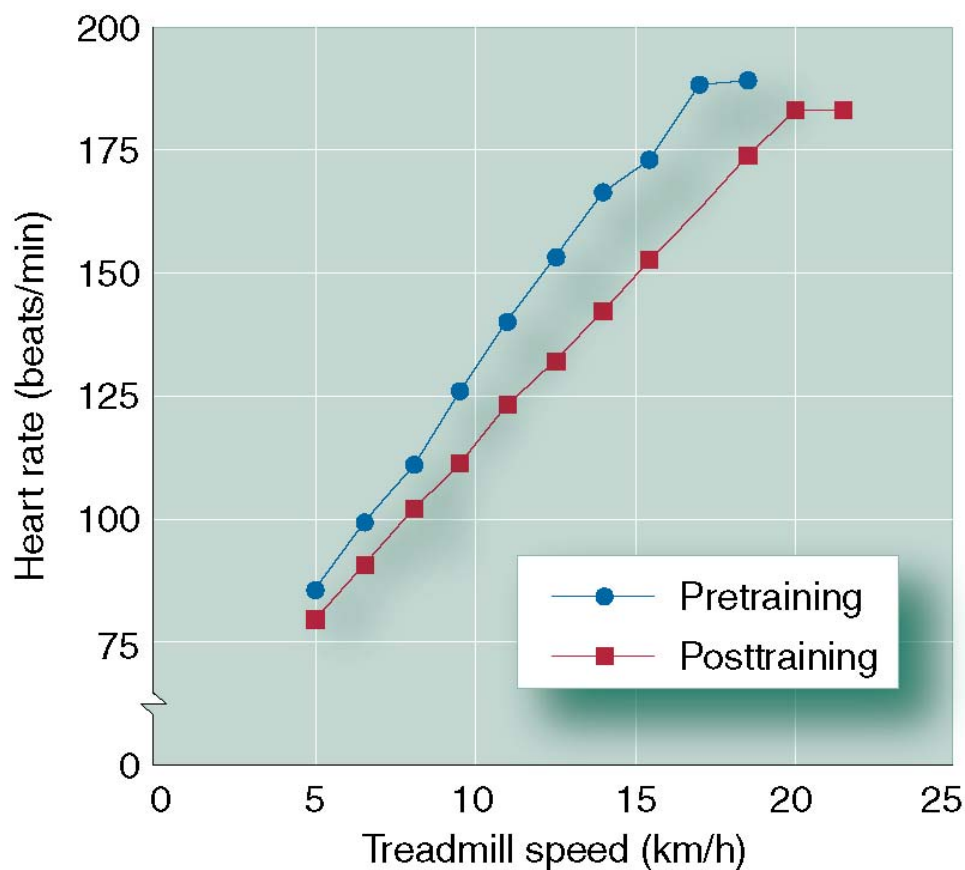
- Analogy: 3 dimmer switches

- Extent to which each one is used depends on intensity

- Intensity also dictates maximum possible duration



Because heart rate increases with intensity, it's a convenient feedback tool for exercise.



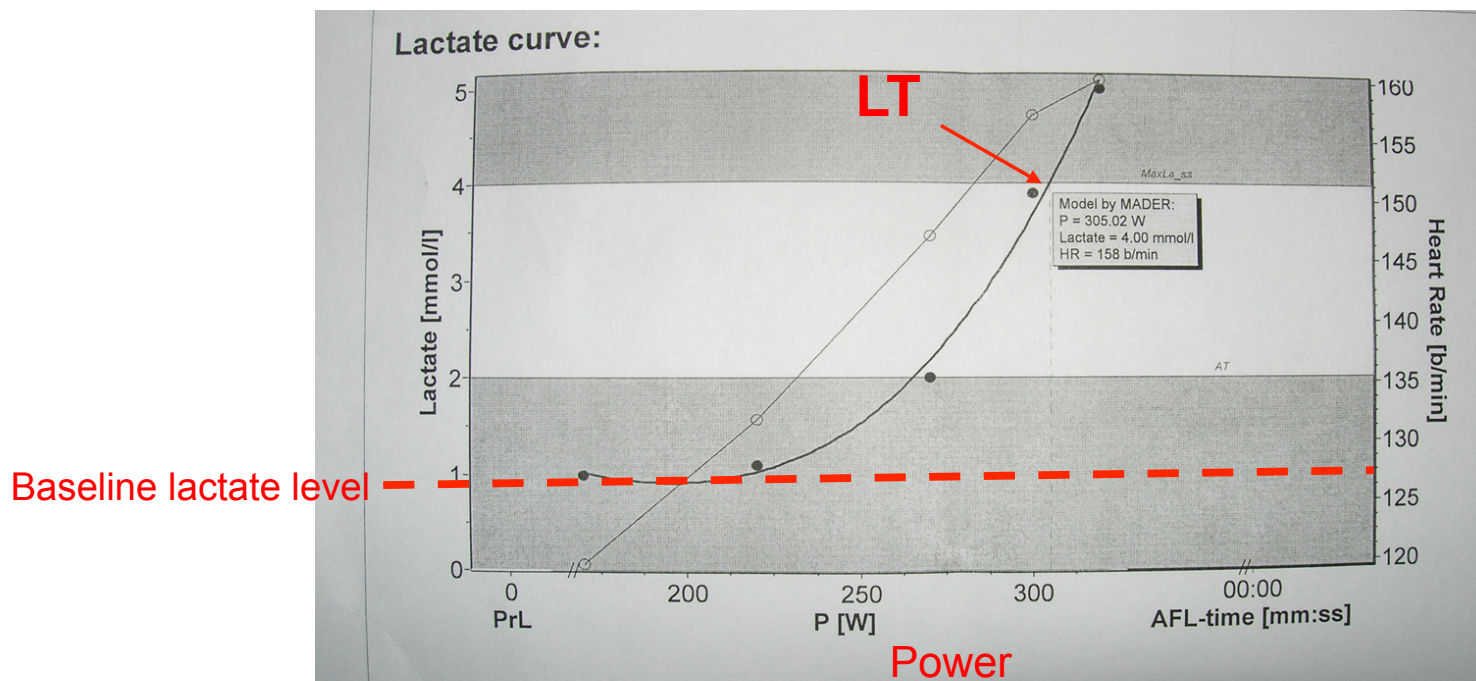
Increasing Intensity (i.e. Working Harder)

Source: Jack Wilmore, et al. *Physiology of Sport and Exercise*, 4th ed. (Champaign, IL: Human Kinetics 2008)

Understanding lactate threshold (LT) is the key to determining training zones

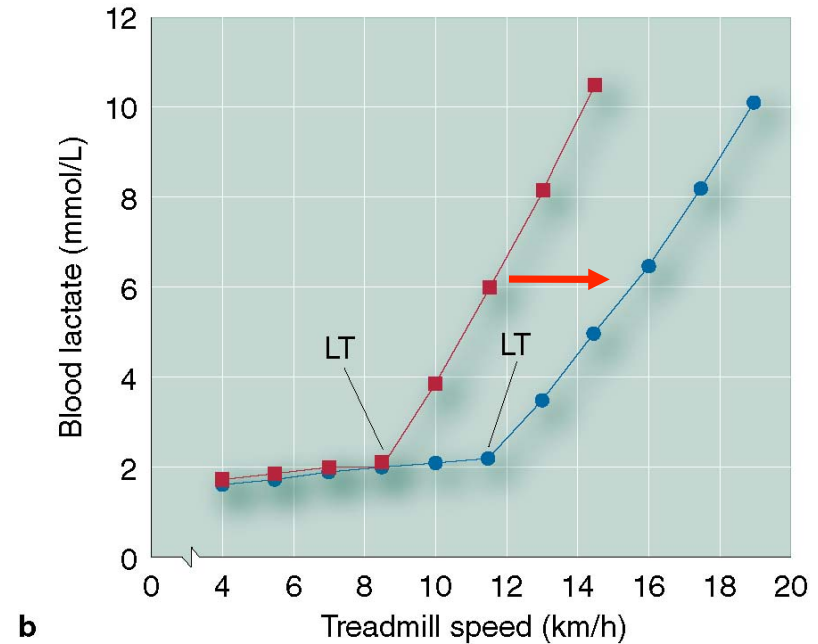
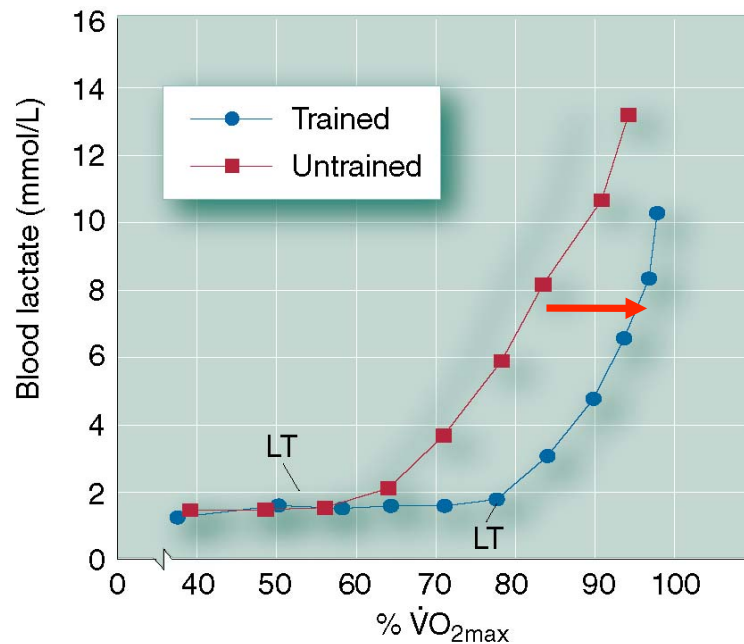
- Lactate is always being produced by the muscles but is also being cleared
- Above LT, lactic acid begins to rapidly accumulate in your working muscles – your muscles will feel heavy with a burning sensation and breathing increases
- It's unsustainable!

David's Blood Lactate Test on the Bike



Improving LT is very trainable

Training around LT (Z4, Z5a), improves your speed and sustain a higher a speed for a longer period of time



Source: Jack Wilmore, et al. *Physiology of Sport and Exercise*, 4th ed. (Champaign, IL: Human Kinetics 2008)

What do the tests, formulas and charts tell you?

- Heart rate increases with intensity so it is a good tool to measure effort
- Power or wattage is workload and a great tool for effort on bike
- Training at a specific heart rate or power zone creates a desired training effect
- Use lactate threshold to set your heart rate zones and/or power zones

What are the different types of tests & what do they tell you?

Formulas

RPE
(Rate of Perceived
Exertion)

Field Tests

Lab Tests

Formulas

- Examples:
 - Max Heart Rate (MHR) = $220 - \text{Age}$
 - Karvonen formula using MHR and Resting Heart Rate
- Pro: Easy, no equipment needed
- Con: Inaccurate for most people – like picking your shoe size based on age

Rate of Perceived Exertion (RPE)

- Examples:
 - What's my heart rate?
 - How hard am I breathing?
 - Are my legs burning?
- Pro: Real-time feedback; always available
- Con: Subjective; better with experience

Borg Rate of Perceived Exertion / HR Zones

RPE	Zone	Description
6	1	
7	1	Very, very light
8	1	
9	2	Very light
10	2	
11	2	Fairly light
12	3	
13	3	Somewhat hard
14	3	
15	4	Hard
16	5a	
17	5b	Very hard
18	5b	
19	5c	Very, very hard
20	5c	

Field Tests

- **Examples:**
 - Graded treadmill, track or stationary bike test
 - Gradually speed (run) or resistance (bike) every minute after 10 minute warm up
 - Look for signs of change (e.g. heavier breathing, leg burn) to indicate LT
 - 30 minute test taking average HR at end of 10, 20, 30 min

- **Pro:** Minimal equipment needed

- **Con:**
 - May be difficult to measure accurately
 - Subject to course conditions (e.g. wind on bike)
 - Taking “average” heart during 30 minute test may pick above or below true LT

Lab Tests

- Examples:
 - VO₂ Max test (measure O₂ consumption vs. CO₂ production)
 - Blood lactate test (measures lactate via blood sample from finger tip prick)
- Pro: Measures actual work output; can be very accurate
- Con:
 - Costs money
 - All equipment not created equal
 - ParvoMedics (used in Olympic Training Center)
 - New Leaf, Cardio Coach (cheap components; not accurate)
 - All testers not equal - look for a degree in exercise science / physiology



Once you have your lactate threshold heart rate (LTHR), you can calculate your zones

Joe Friel's Bike Zones
Based on LTHR

	HEART RATE RANGE	
ZONE	FROM:	TO:
Z1		< 81% * LTHR
Z2	81% * LTHR	89% * LTHR
Z3	90% * LTHR	93% * LTHR
Z4	94% * LTHR	99% * LTHR
Z5a	100% * LTHR	102% * LTHR
Z5b	103% * LTHR	106% * LTHR
Z5c	>106% * LTHR	

Joe Friel's Run Zones
Based on LTHR

	HEART RATE RANGE	
ZONE	FROM:	TO:
Z1		< 85% * LTHR
Z2	85% * LTHR	89% * LTHR
Z3	90% * LTHR	94% * LTHR
Z4	95% * LTHR	99% * LTHR
Z5a	100% * LTHR	103% * LTHR
Z5b	103% * LTHR	106% * LTHR
Z5c	>106% * LTHR	

Joe Friel's Zones are probably the most widely used

Helpful hint: Simplify by just using 5 zones

Source: Joe Friel, *Training Bible Coaching* (www.trainingbible.com)

Training within a specific heart rate or power zone creates a desired training effect

Joe Friel's Heart Rate Training Zones (Most Widely Used)

Zone	Effort	Description and Purpose
Zone 1	Easy	Recovery. Easy pace. Aerobic endurance building.
Zone 2	Easy to moderate	Extensive endurance. Usually hold for a long time. Aerobic endurance building.
Zone 3	Medium	Intensive endurance/ muscular endurance. Tempo. Progress to threshold.
Zone 4	Medium Fast	Sub-threshold. Time trial. Improve and sustain around lactate threshold.
Zone 5a	Fast	Super threshold. Hard to maintain. Sustain lactate threshold.
Zone 5b	Very fast	Anaerobic endurance. Improve VO2 Max. Very difficult to maintain.
Zone 5c	Explosive	Power. All out sprint. Increase power.

Lactate Threshold

Adapted from: Joe Friel, *Training Bible Coaching* (www.trainingbible.com)

Structure for workouts in each training zone to improve performance

Joe Friel's Heart Rate Training Zones (Most Widely Used)

Zone	Effort	Example Workouts
Zone 1	Easy	Easy spin on the trainer.
Zone 2	Easy to moderate	2 hour ride on rolling hills, moderate effort.
Zone 3	Medium	20 min Z2, 20 min Z3, 20 min Z2
Zone 4	Medium Fast	Z2 run with 2 x 10 min Z4 (5 min rest in between); 40km time trial on the bike
Lactate Threshold		
Zone 5a	Fast	5km to 10km running race
Zone 5b	Very fast	Warm up then 2 sets of 4 x (1 minute on, 3 minute off) with 15 min in between.
Zone 5c	Explosive	8 x 15s sprint as fast as you can with 2 min recovery in between

Adapted from: Joe Friel, *Training Bible Coaching* (www.trainingbible.com)

But remember, heart rate & power training zones are just tools

- Thinking of training zones like a continuum rather than an absolute, as they are man-made definitions.
- Never be a slave to your monitor or power meter. Batteries may die. Parts may fall off or break.
- Always use with perceived effort. Learn your body.
- Heart rate can fluctuate due to a number of factors including:
 - Fitness level and overall health
 - External conditions: air / water temperature, terrain
 - Sitting (bike) vs. standing (run) vs. lying down (swim)
 - Internal conditions: anxiety, fatigue, hydration status, caffeine intake
 - Over time (cardiac drift)
- Other tools also available: pace, speed, cadence

Thank you for your time today!

- You can find this webinar and other great resources in the “Resources” section at enduranceworks.net
- To provide feedback, ask questions or sign up for testing services, please contact me:

Krista Schultz, MEd, CSCS

Email: krista@enduranceworks.net

Web: <http://enduranceworks.net>

Krista’s blog: <http://kristaschultz.com>

Cell: 443-414-5846