

# Training for Endurance Performance

Jack Daniels

**Center for High Altitude Training**

Flagstaff, Arizona

# Some Considerations

- **All the answers No-one**
- **Coach's job**
- **Wasted time training**
- **Coaches – Scientists**
- **Avoid injury**
- Everyone is different
- Athletes are people
- Achieve basic fitness
- Test when fit
- Focus on the task

# The 5 Ingredients of Success

- 1 Inherent Ability
- 2 Motivation
- 3 Opportunity
- 4 Direction

# **#1 Inherent Ability**

- **Anatomical**
- **Biomechanical**
- **Physiological**

# **#2 Motivation**

**Intrinsic**

**Not parents**

**Not peers**

**Not coach**

# Types of Individuals

- 1 Great ability + High motivation Champion
- 2 Great ability + Low motivation Coach frustrator
- 3 Little ability + High motivation Self frustrator
- 4 Little ability + Low motivation No show

# **#3 Opportunity**

- **Facilities**
- **Competition**
- **Equipment**
- **Travel**

# #4 Direction

Program

Teacher

Coach

Potential for Negative

# How Do We Train ?

- **The surviving-egg theory?**
- **What my coach did to me?**
- **What do the champions do?**
- **We need some guiding principles**

# A Week in High School 1967

**Sun** 10 miles in 63 minutes

**Mon** 2mile 9:55 + 2X1 5:15 + 3X800 2:28  
+6X400 65 + weights

**Tue** 6X400 64 + 10X140 18 + 5X200 32 +

**Wed** 50X400 @ 69

**Thu** 18X800 @ 2:45

**Fri** Mile + 1320 + 880 + 660 + 440 + 3mi

**Sat** Race day

# American HS Record Holder 5k

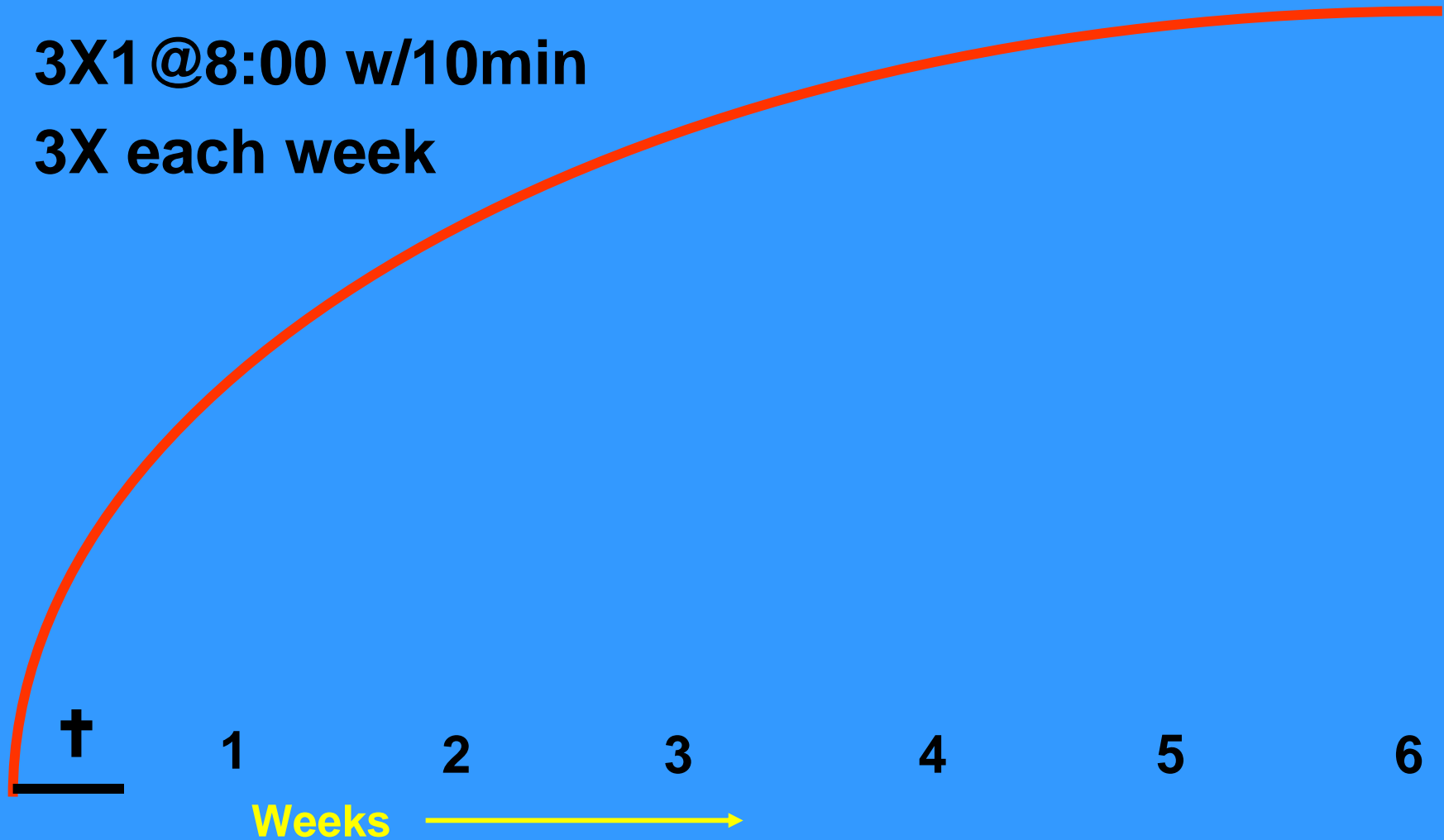
- Longest single training run ? 66 miles
- Most miles in 1 week ? 360 miles
- Weekly average for 6 weeks? 300 miles
- Greatest weekly average/yr ? 240 miles
- Figure average of 8-9 MPH = much time

# Principles of Training

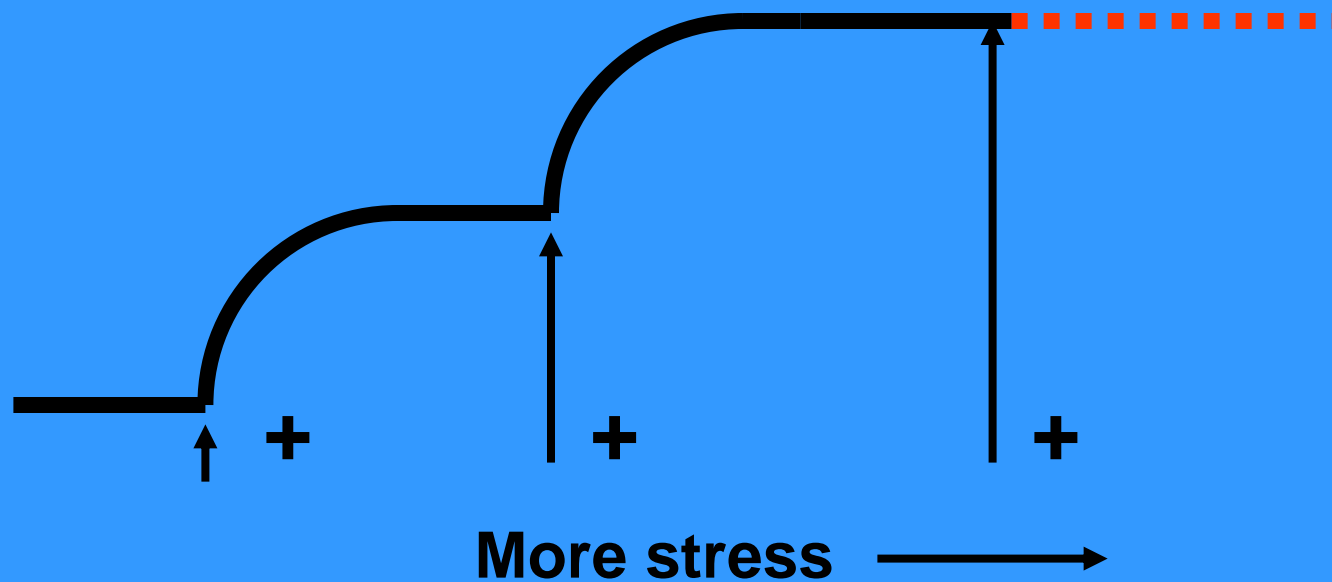
- 1 The body reacts to stress
- 2 Specificity
- 3 Benefit depends on type of stress
- 4 Ease of maintenance
- 5 Rate of achievement
- 6 Personal limits
- 7 Diminishing return &  
accelerating setbacks

# Rate of Achievement

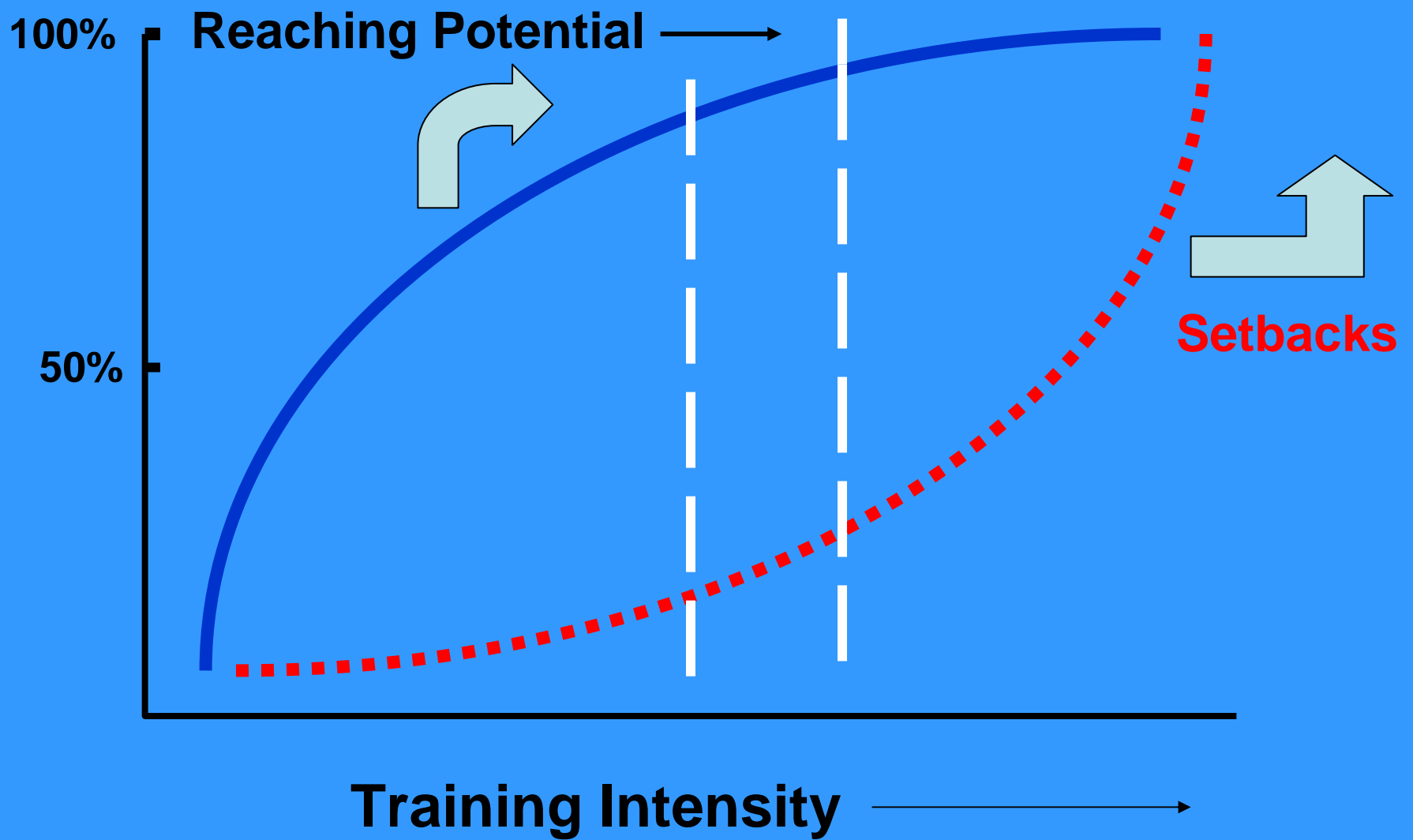
**3X1 @8:00 w/10min**  
**3X each week**



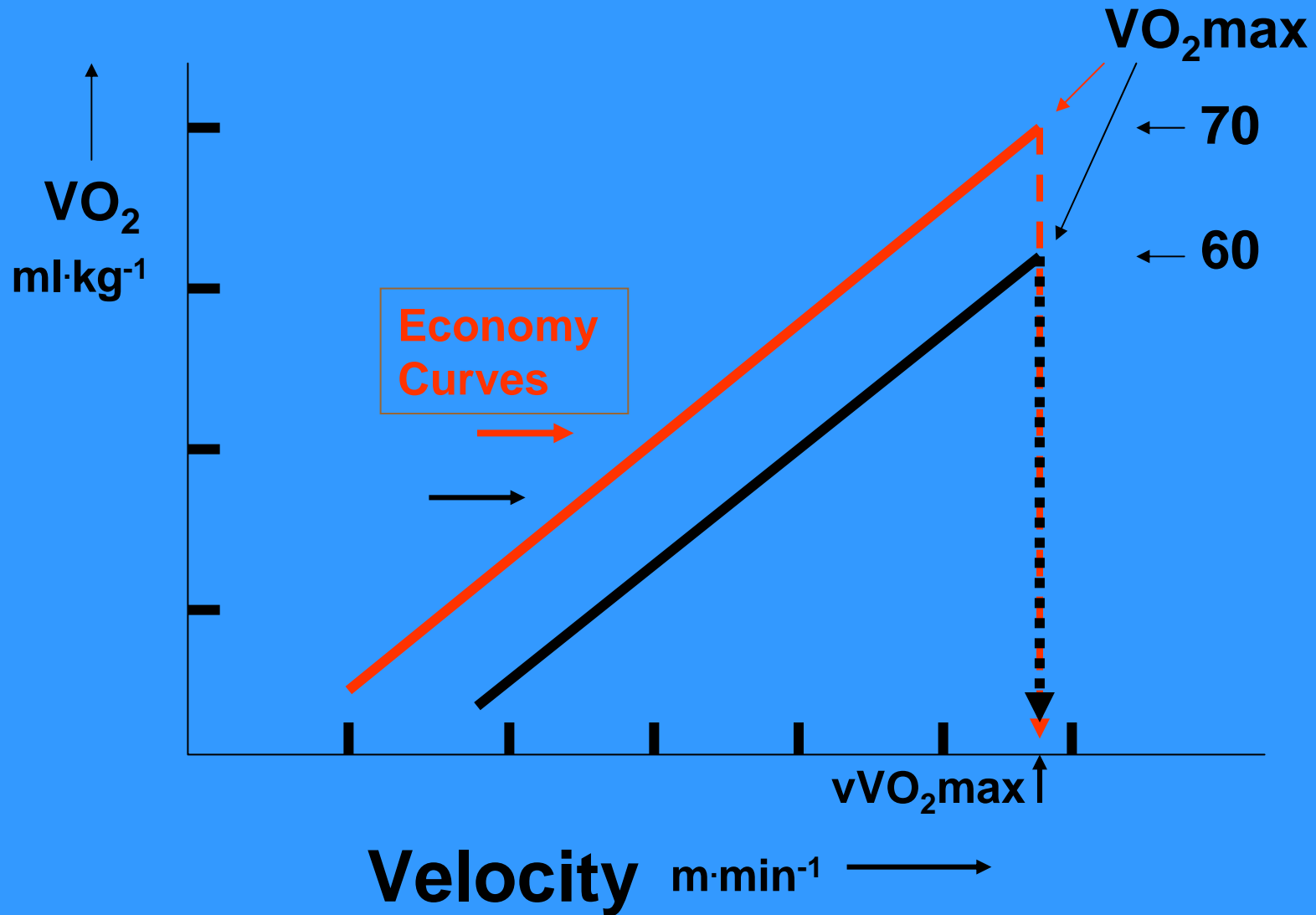
# Improvement (or not) with Increased Stress



# Diminishing Return — Accelerating Setbacks

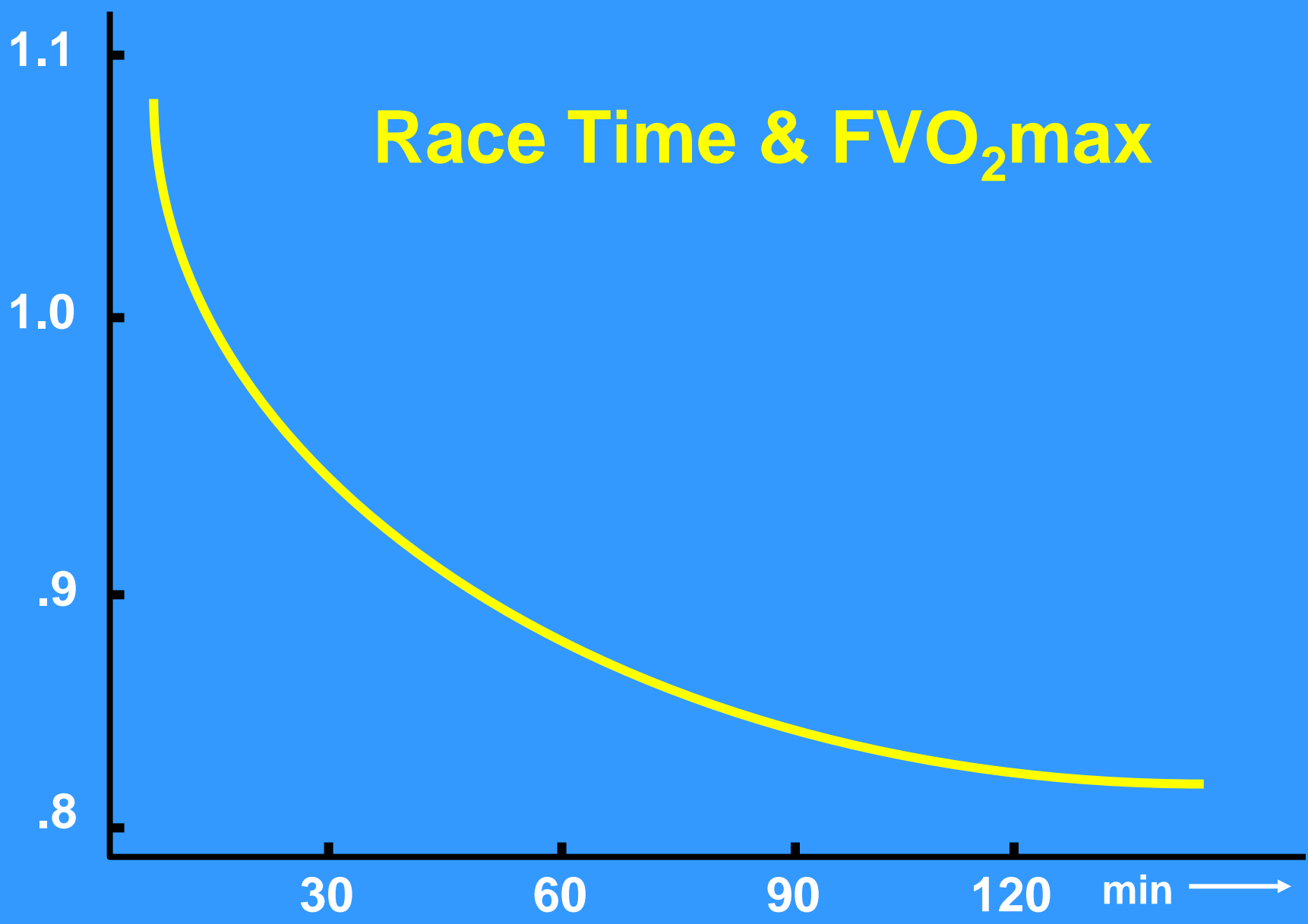


# Aerobic Profiles

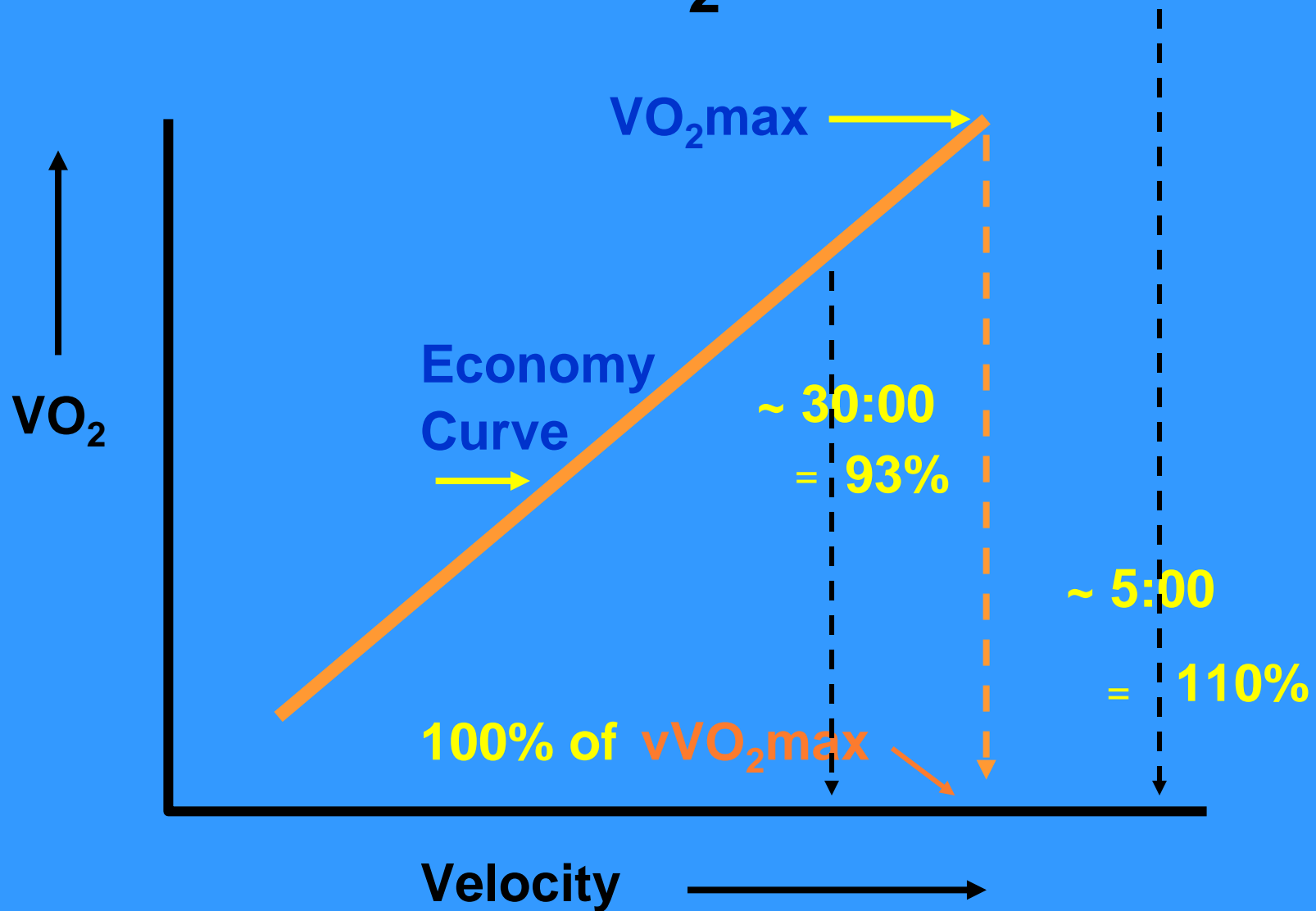


FVO<sub>2</sub>max

# Race Time & FVO<sub>2</sub>max



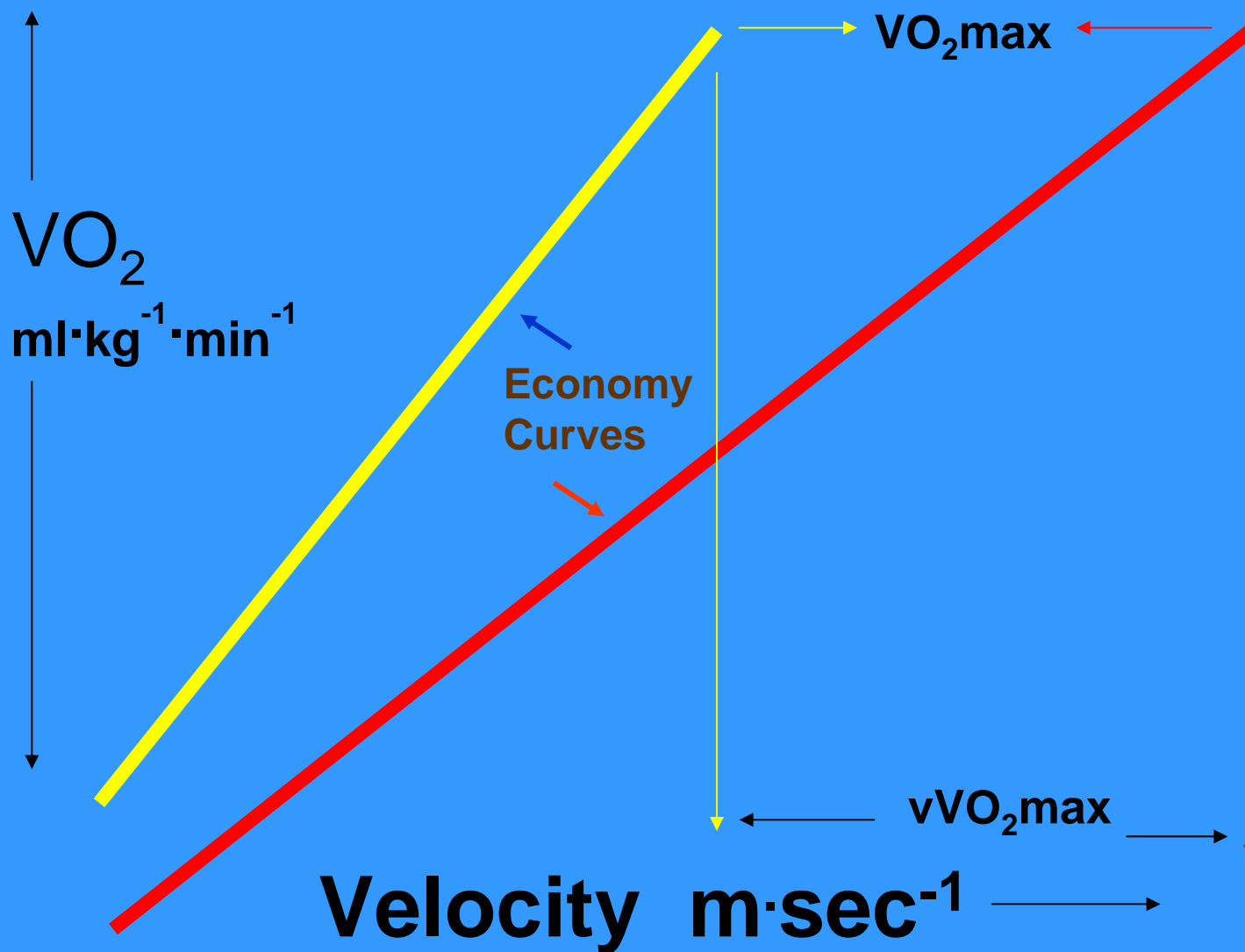
# What Does $vVO_2\text{max}$ Tell You ?



# Aerobic Profiles

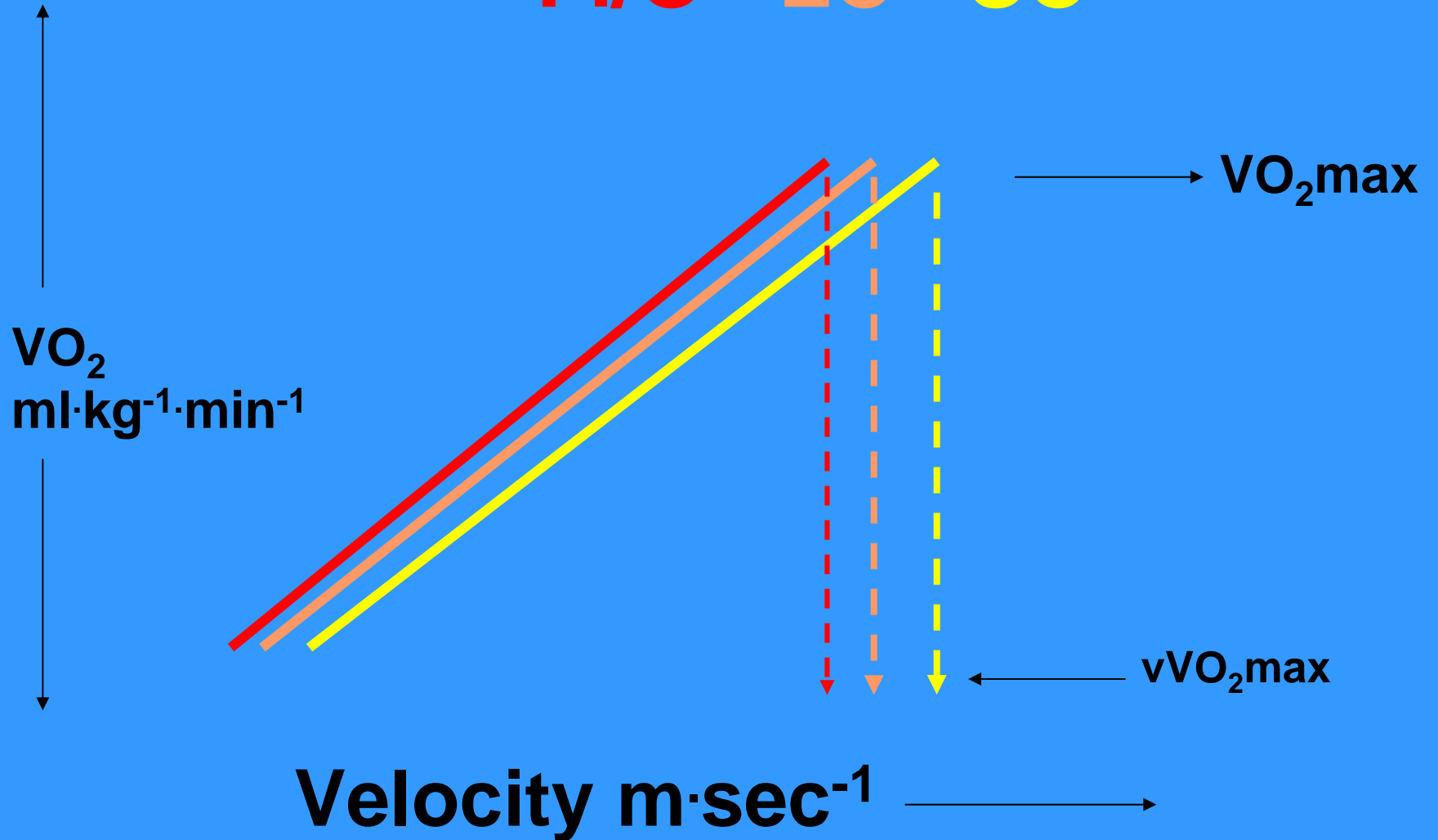
Young age-group

Elite women



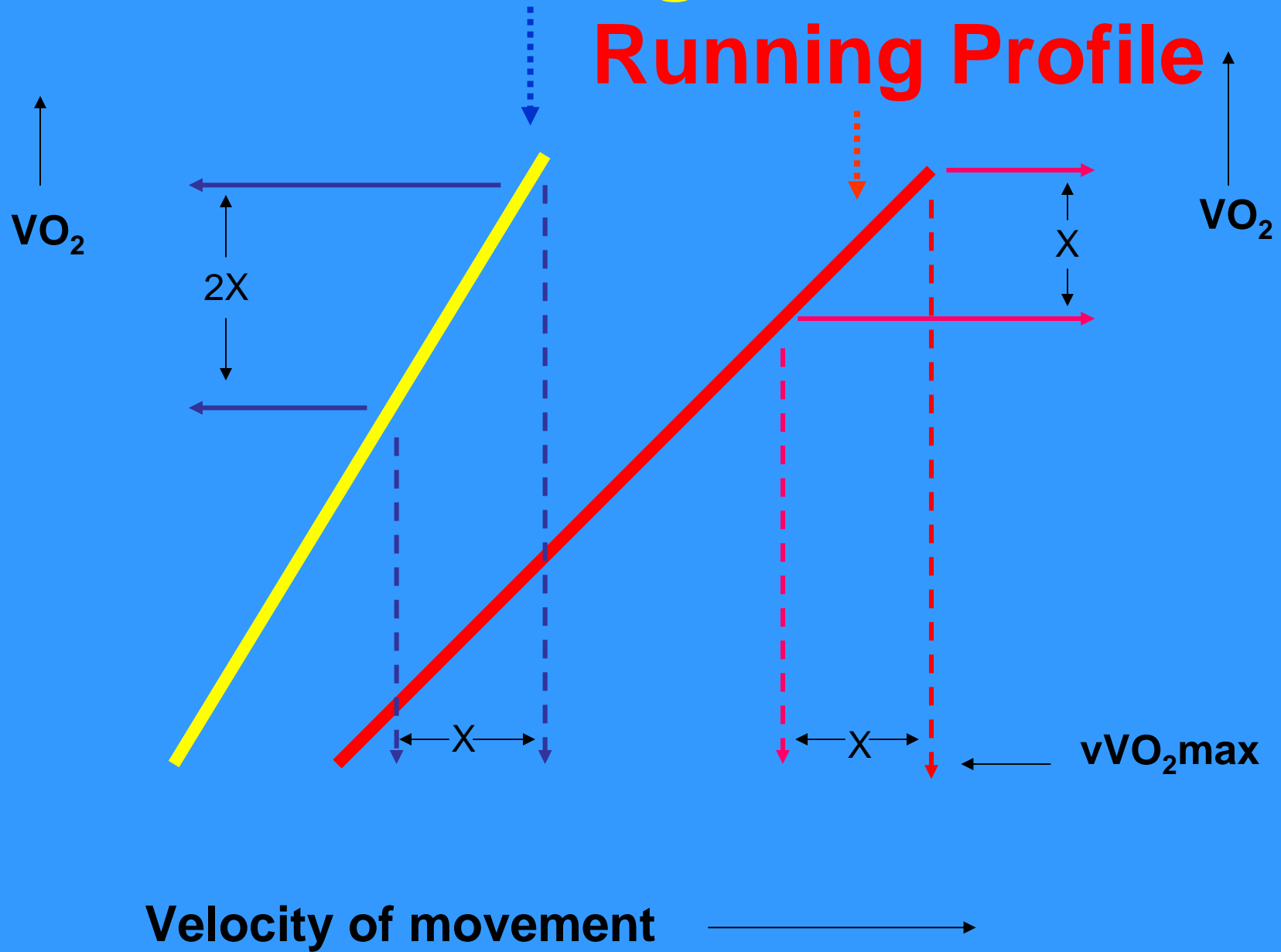
# Aerobic Profiles

**FI/O**   **LC**   **SC**



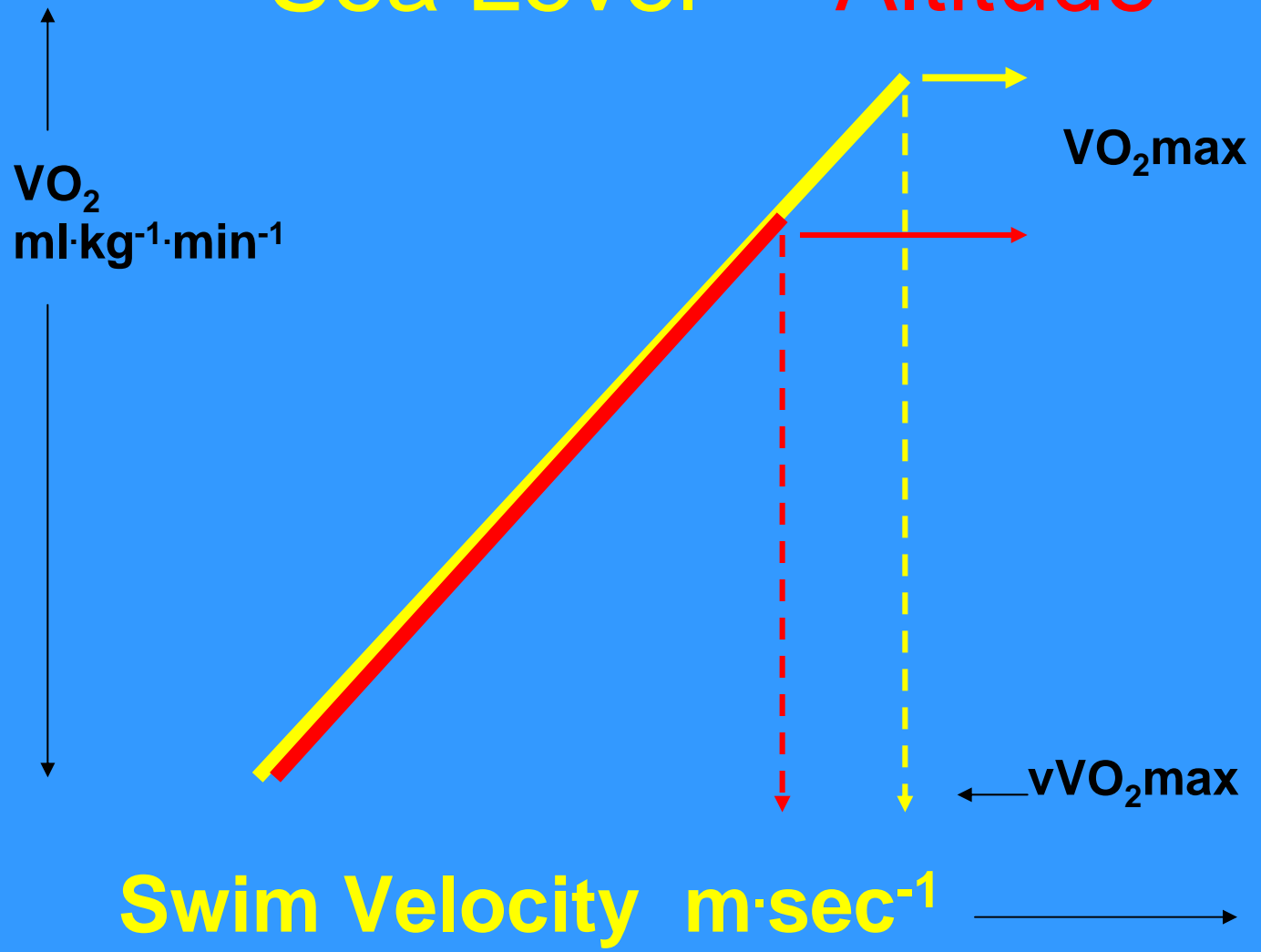
# Swimming Profile

# Running Profile



# Aerobic Profiles

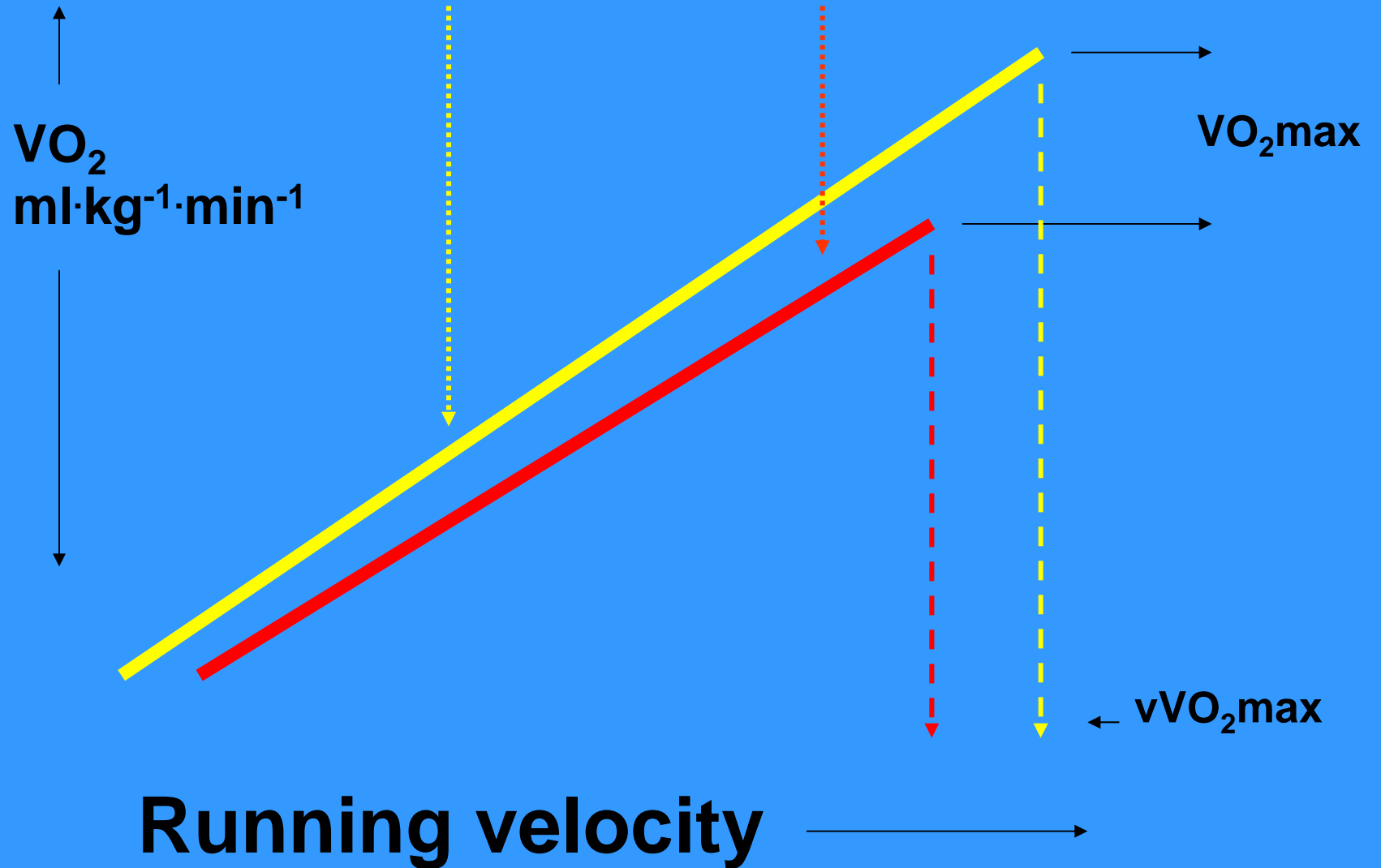
Sea Level      Altitude



# Running Aerobic Profiles

Sea Level

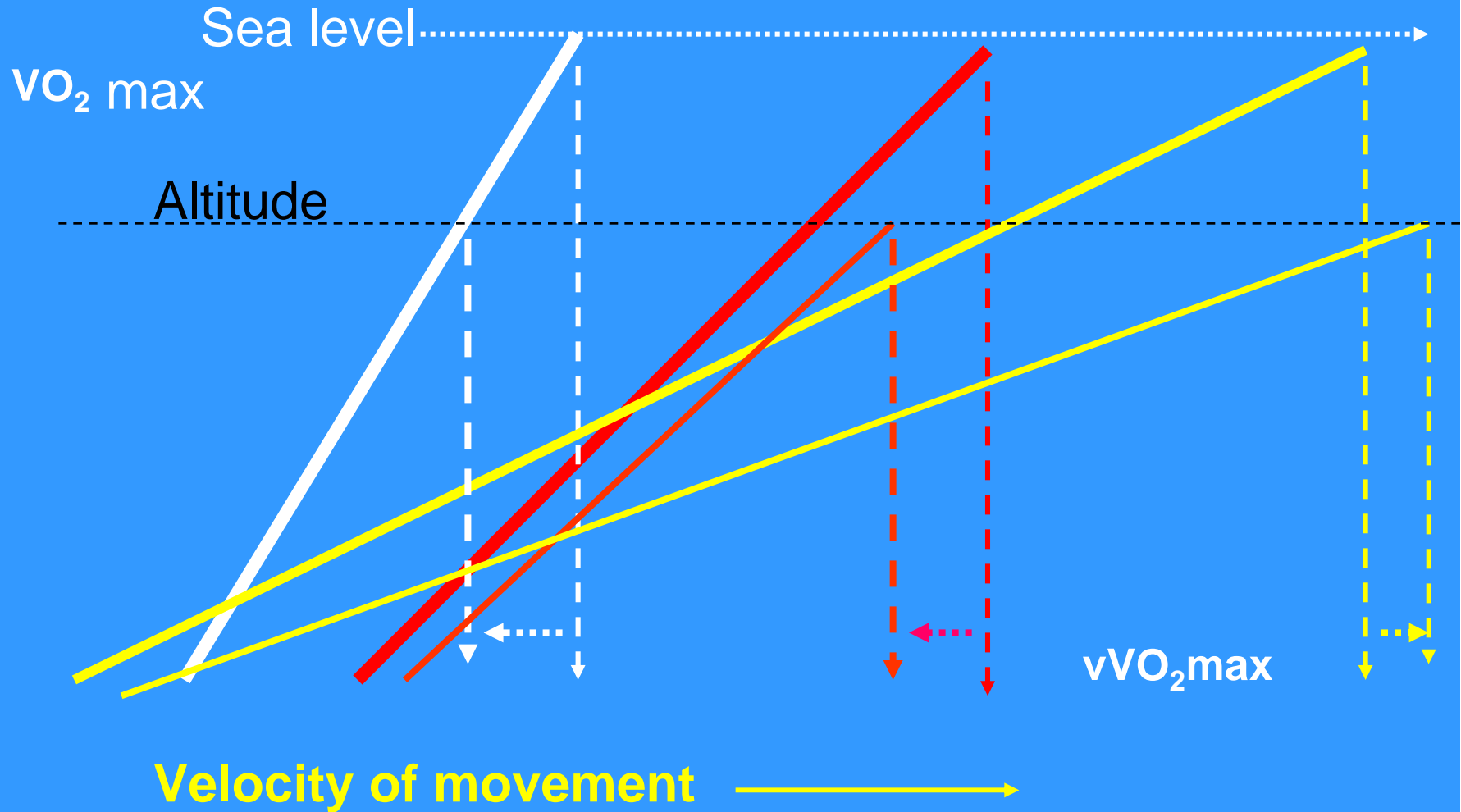
Altitude



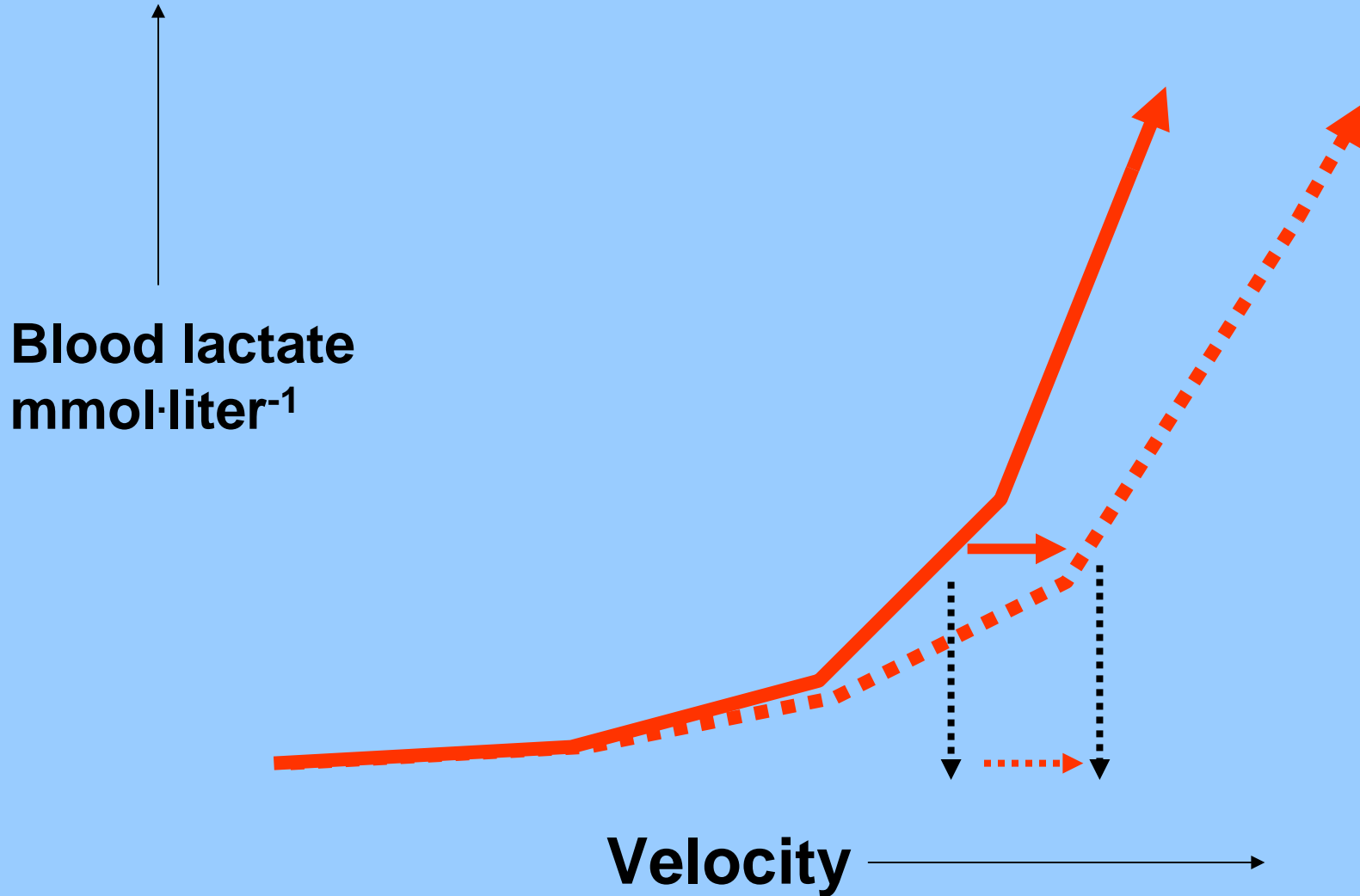
# Swim Profile

**Run Profile**

**Bike Profile**

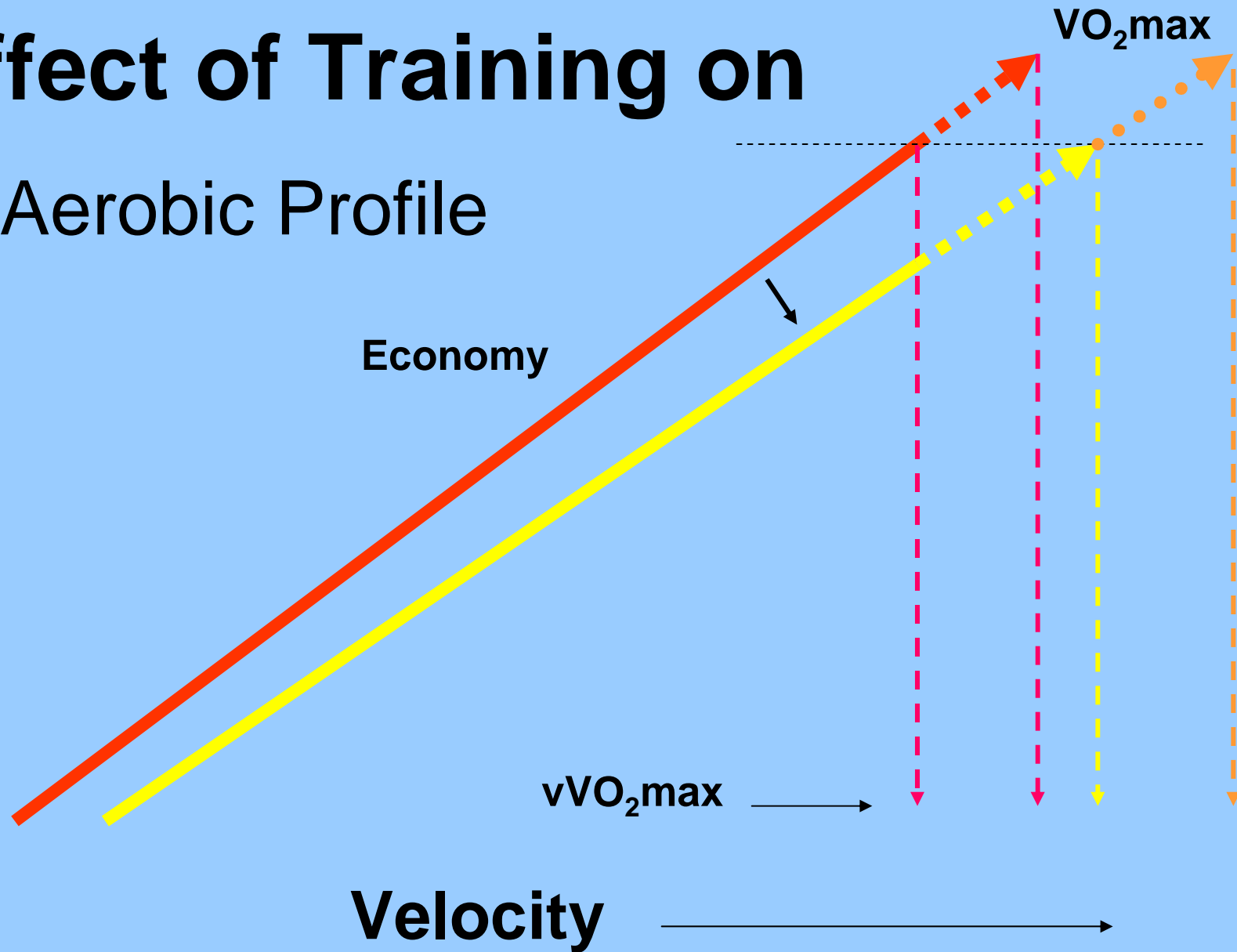


# Lactate Profile



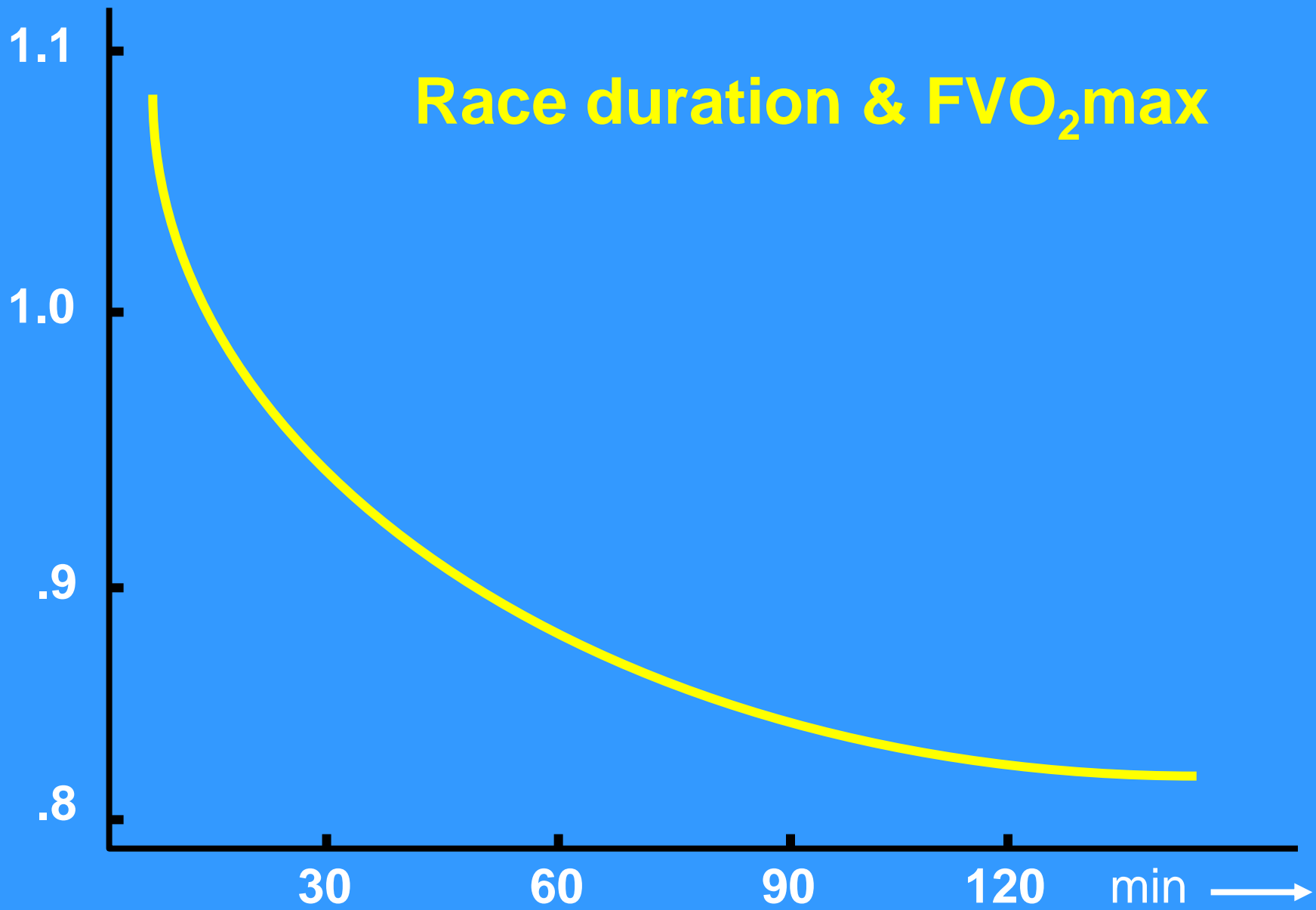
# Effect of Training on

## Aerobic Profile

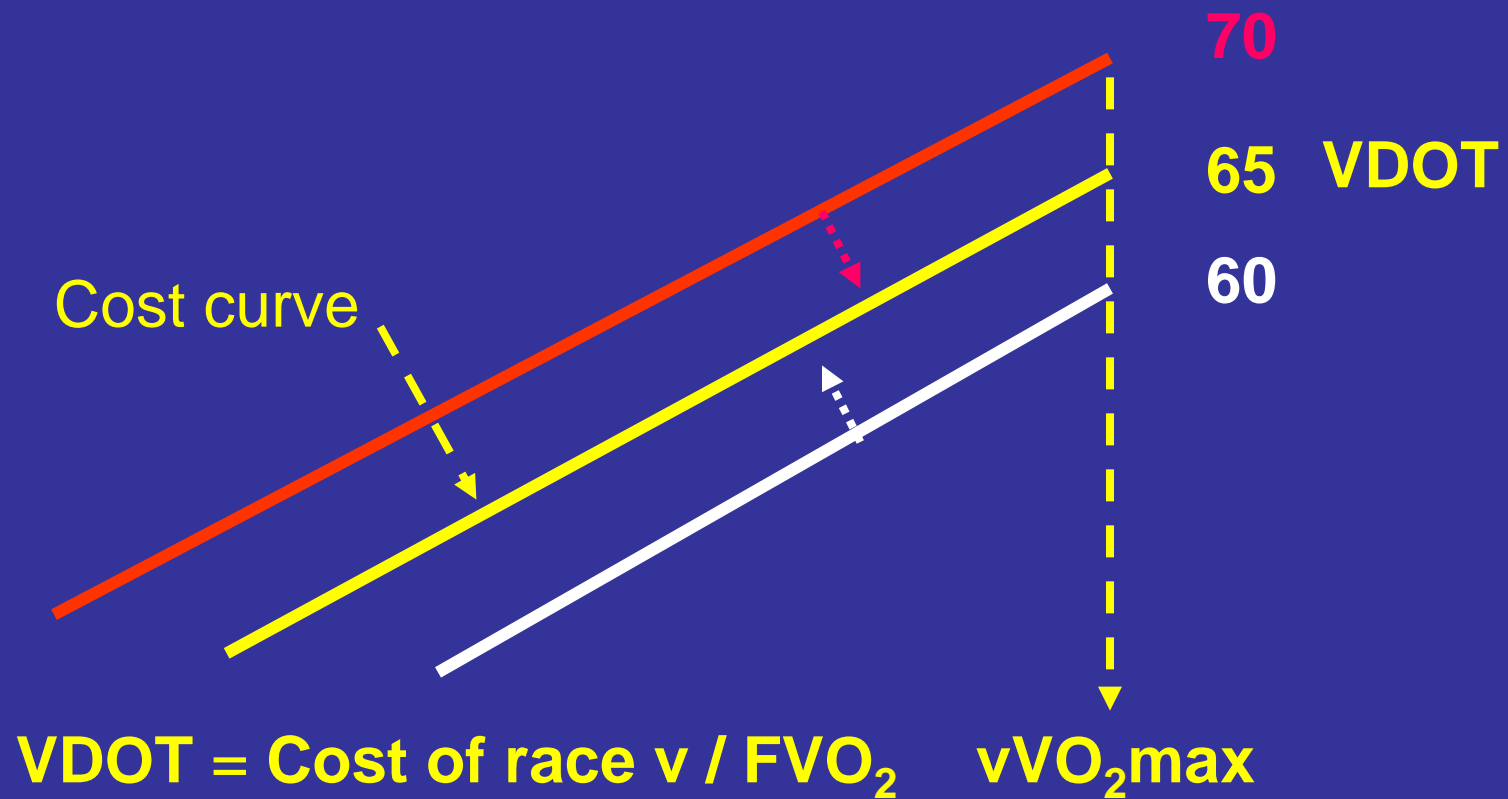


FVO<sub>2</sub>max

# Race duration & FVO<sub>2</sub>max



# Calculating a VDOT



# VDOT & Training Intensity

<u>VDOT</u>	<u>mile</u>	<u>10k</u>	<u>42k</u>	<u>MP</u>	<u>TP</u>	<u>IP</u>	<u>RP</u>
50	5:50	41:20	3:11	7:16	6:51	3:54/6:16	87
60	4:57	35:22	2:43	6:13	5:54	3:23/5:26	75
70	4:19	31:00	2:23	5:27	5:13	2:59/4:46	65
80	3:51	27:41	2:08	4:52	4:41	2:41/4:47	58

# Purposes of Training

- 1 Increase available energy
- 2 Improve speed
- 3 Improve economy
- 4 Improve endurance

# Types of Training

E/L



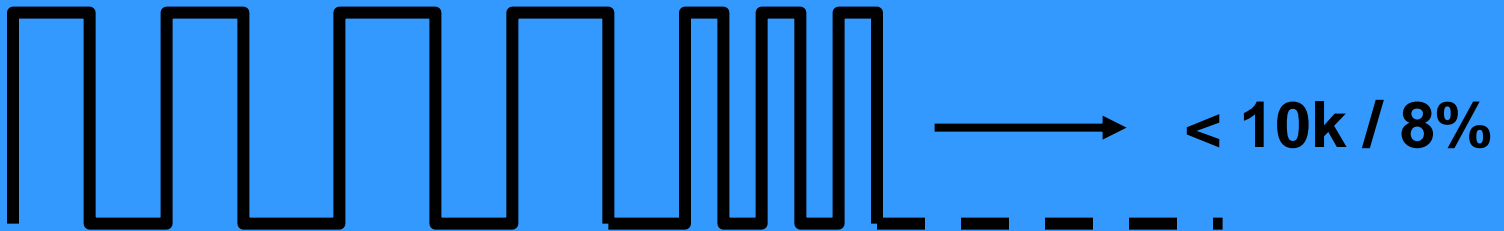
MP



T



I



R



# Types of Training

	<b>%VO<sub>2</sub>max</b>	<b>%HRmax</b>
• <b>Easy</b>	<b>~60-75%</b>	<b>(65-79%)</b>
• <b>MP</b>	<b>~75-84%</b>	<b>(80-89%)</b>
• <b>TP</b>	<b>~83-88%</b>	<b>(88-92%)</b>
• <b>IP</b>	<b>~95-100%</b>	<b>(98-100%)</b>
• <b>RP</b>	<b>na</b>	<b>na</b>

# Types of Training

<b>E /L</b>	<b>30 – 150 min</b>	<b>na</b>
<b>MP</b>	<b>60 – 100 min</b>	<b>na*</b>
<b>TP</b>	<b>up to 10% (4 – 15 miles) or up to 20 min steady</b>	<b>5w/1r</b>
<b>IP</b>	<b>up to 8% (max = 10,000m) up to 5 min per work bout</b>	<b>1w/1r</b>
<b>RP</b>	<b>up to 5% (max = 5 miles) up to 2 min per work bout</b>	<b>1w/4r</b>



# Tracking Training Intensity

**E/L = 0.20 X minutes of easy running**

**(60 min = 12 points)**

**MP = 0.40 X minutes at M pace**

**(60 min = 24 points)**

**T = 0.67 X minutes at T pace**

**(30 min = 20 points)**

**I = 1.00 X minutes at I pace**

**(20 min = 20 points)**

**R = 1.50 X minutes at R pace**

**(12 min = 18 points)**

# Tracking Training Intensity

<u>Example Week</u>	<u>Pts</u>
120min E 120 X .2	= 24
60min E + 6X3min I = 12 + 18X1	= 30
90min E 90 X .2	= 18
90min E 90 X .2	= 18
30min E + 40min T = 6 + 40X.67	= 33
90min E 90 X .2	= 18
30min E + 30min I = 6 + 30X1	= 36
<b>Week Total</b>	<b>= 177</b>

# Setting up a Season of Training

- I      **F I**      **Base and injury resistance**
  
- II     **I Q**      **Prepare for training ahead**
  
- III    **T Q**      **Systems of importance**
  
- IV    **F Q**      **Peak performance**


# Season Schedule

I

II

III

IV



<b>FI</b>	<b>IQ</b>	<b>TQ</b>	<b>F</b> <b>Q</b>
<b>1</b>	<b>4</b>	<b>3</b>	<b>2</b>

# How Many Weeks per Season

I	II	III	IV
1 2 3	10 11 12	7 8 9	4 5 6
13	18	14	17
21	19	15	22
23	20	16	24

# Sample Week of Training

1      2      3      4      5      6      7

L	Q1 (E)	(Q1) E	Q2	E	E	Q3 (Q2) Race?
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# Weekly Training Schedule

Q1 = **I** (interval training) or **R** or **MP**

Q2 = **T** (threshold work) or **R**

Q3 = **RACE** OR -- **T + I + R + E**

# Example 2/12/04

2 **E** (6:30) + 10 **MP** (5:37) + 1 **T** (5:21)

+ 5 **MP** (5:37) + 1 **T** (5:19) + 2 **E** (6:20)

= 2:00:35 for 21 miles (**97 points**)

# Speed/Endurance Finder

400	800	1500/mile
46	1:41+	3:27+/3:44
48	1:45+	3:36+/3:53
50	1:50	3:45+/4:03
52	1:54+	3:54+/4:13
54	1:58+	4:03+/4:23
56	2:03+	4:12+/4:32+
58	2:07+	4:21+/4:42+
60	2:12	4:30+/4:52
62	2:16+	4:39+/5:02
64	2:20+	4:48+/5:11
66	2:25+	4:57+/5:21+
68	2:29+	5:06+/5:31+
70	2:34	5:15+/5:41
72	2:38+	5:24+/5:50+
74	2:42+	5:33+/6:00+
76	2:47+	5:42+/6:10+
78	2:51+	5:51+/6:20
80	2:56	6:00+/6:29+

# Altitude Training

- Altitude natives win at sea level
- Elite sea-level athletes move to altitude (and continue to win at sea level)
- Would-be elites can't afford altitude so spend their money on altitude tents
- Without altitude you can't be elite ?

# Live-high Train-low

- So speed is not lost?
- Easy intensity is about 80-85% of work
- Fast, repetition work is not affected
- How about threshold training ?
- How about Interval training ?
- How about altitude natives ?
- Do we send the right message ?

# **#5 Focus**

**The Final Ingredient of Success**