

Podium Education Project

December 9-11, 2008
Las Vegas, Nevada

Training Responses
in Marathoners
December 10, 2008
8am – 9:30am - Florentine C
Dr. Joe. I. Vigil

Adaptation

- **Adaptation to Training** is the sum of modifications brought about by systematic repetitions of exercise.
- The changes are a result of specific demands placed on the body by the specific activity pursued.

Adaptation

- These changes are dependent on the:
 - Volume
 - Intensity
 - Frequencyof the training.
- If the stimulus (or load) is not sufficient to challenge the metabolism, no adaptation will occur.

Current Fitness

- Because maximum velocity at VO_{2MAX} for most athletes corresponds very closely with race ability, we use that figure (mile time at VO_{2MAX}) to determine training paces for:
 - Aerobic Pace Training
 - Marathon Pace
 - Lactate Threshold Development
 - VO_{2MAX} Development
 - Running Economy Intervals

Current Fitness

- If training paces are practiced accurately, approximate predictions for various race distances can be determined.

Aerobic Base Training

- Aerobic Base Training is between 65-75% of your VO_{2MAX} pace at your current fitness level.
- Continuous running at this pace for 20 minutes to several hours trains your aerobic system to use fatty acids as your primary energy source and allows your body to retain glycogen for faster paces.

Aerobic Base Training

- Running slightly slower than the given pace will aid in weight loss.
- Running faster than the given pace decreases the rate at which your body's aerobic system will adapt and improve, and will also hinder recovery after workouts.

Aerobic Base Training

EXAMPLE #1:

4:00 Flat Mile – 240 Seconds
65% $240 \div 65 = 369$ Seconds
6:09 Pace
75% $240 \div 75 = 320$ Seconds
5:20 Pace
Run Between 6:09 - 5:20 Pace

Aerobic Base Training

EXAMPLE #2:

5:00 Flat Mile – 300 Seconds
65% $300 \div 65 = 461$ Seconds
7:41 Pace
75% $300 \div 75 = 400$ Seconds
6:40 Pace
Run Between 7:41 - 6:40 Pace

Aerobic Base Training

EXAMPLE #3:

6:00 Flat Mile – 360 Seconds
65% $360 \div 65 = 554$ Seconds
9:22 Pace
75% $360 \div 75 = 480$ Seconds
8:00 Pace
Run Between 9:22 - 8:00 Pace

Adaptation Response

- Slower than prescribed pace provides no challenge to individual's adaptation threshold.
- Faster than prescribed pace fails to create higher oxidative potential.

Adaptation Response

- Points to Remember:
 - Aerobic response is when the cell is able to utilize available O_2 .
 - Stay within Training Zone.
 - When training stops, VO_{2MAX} and cellular O_2 utilization drop off dramatically.

Marathon Pace Training

- The literature states that a marathon pace is 84% of your current VO_{2MAX} pace.
- Experience shows very few runners that can run at this pace.
- The preference is to start at 75% of present VO_{2MAX} pace, then go to 80%, then 85%, as the charts indicate.

Marathon Pace Training

- In the 14-week program prescribed, use one day a week for marathon pace training.
- Work up to a distance of 30K (18.6 miles).
- At this pace, hydration and refueling can be practiced while running.

Lactate Threshold Development

- Lactate threshold development pace is normally 88% of your current VO_{2MAX} pace.
- Under normal and average conditions, it can also be at a HR pace of 168-172, however, this is not always accurate.

Lactate Threshold Development

- At the above-prescribed pace, lactic acid and other metabolic residues will accumulate faster than they can be removed.
- Running slightly slower develops more efficient waste removal, allowing you to run aerobically at faster speeds by delaying the onset of anaerobic-only energy production.

Lactate Threshold Development

- These runs should be 20 minutes to 15 miles in length.
- If shorter distances are practiced, each distance should be followed by one-minute intervals (jog-rest).

Lactate Threshold Development

➤ 3Ks, 4Ks, 5Ks - or - 3M, 4M or 5M Distances

Fractionalization

VO₂ at Lactate Velocity (67) mls

÷

VO_{2MAX} 81 mls

67 ÷ 81 = 81%

Lactate Threshold Development

EXAMPLES:

Current

Fitness Level

4:00 Mile -- 240 Seconds ÷ 80%

300 Seconds or 5:00 Pace

4:30 Mile -- 270 Seconds ÷ 80%

350 Seconds or 5:50 Pace

Lactate Threshold Development

EXAMPLES:

Current

Fitness Level

5:00 Mile -- 300 Seconds ÷ 80%

375 Seconds or 6:15 Pace

5:30 Mile -- 330 Seconds ÷ 80%

412 Seconds or 6:42 Pace

Lactate Threshold Development

EXAMPLES:

Current

Fitness Level

6:00 Mile -- 360 Seconds ÷ 80%

450 Seconds or 7:30 Pace

4:28 Mile -- 268 Seconds ÷ 88%

306 Seconds or 5:06 Pace

15K -- 47:12 A.R. 5:02 Pace

Predictive Time Chart

Please Refer To Predictive Time Chart

VO_{2MAX} Development

➤ VO_{2MAX} development intervals are run at 95-98% of your current VO_{2MAX} pace.

➤ A major physiological benefit of this training is the enlargement and strengthening of the heart (left ventricle), improving its ability to transport blood and oxygen to the muscles.

VO_{2MAX} Development

- It also improves lactate tolerance, the ability to withstand acid build up, which increases your maximum endurance velocity.
- Rest between VO_{2MAX} repetitions should be two minutes at sea level; three minutes at altitude for repetitions longer than 800 meters (800, 1K, 2K, 3K, 4K, 5K, Miles, 2 miles, 3 miles).

VO_{2MAX} Development

- Slightly less than the repetition time for 600s, 400s, 300s, 200s, 150s and 100s.

VO_{2MAX} Development

EXAMPLES:

4:00 • Mile 240 Seconds ÷ 95 = 253 Seconds
Repeats – 4:13 Miles

240 Seconds ÷ 98 = 245 Seconds
Repeats – 4:05 Miles

(Please Refer to Mile Chart)

VO_{2MAX} Development

EXAMPLES:

2:00 • 800 120 Seconds ÷ 95 = 126 Seconds
Repeats – 2:06 Miles

120 Seconds ÷ 98 = 122 Seconds
Repeats – 2:02 Miles

(Sebastian Coe: 6 x 800 at 1:49:5)

VO_{2MAX} Development

EXAMPLES:

50 Flat 400 50 Seconds ÷ 95 = 53 Seconds
Repeats

50 Seconds ÷ 98 = 51 Seconds
Repeats

Note: All distances are computed the same way.

Running Economy

- Running economy is the energy demand for a given velocity of submaximal running.
- It is determined by measuring oxygen consumption and respiratory ratio.
- The intensity or velocity is known as steady-state and is aerobic in nature.

Running Economy

- The lower the energy expended at a specific velocity, the better economy a runner is said to have.
- The goal is to be able to run faster at a lower energy cost.
- To give a runner an advantage over the competition, running economy is a very important part in the Training Plan.

Modalities to Improve Running Economy

Different modalities that can be practiced to improve running economy are:

Metabolic

- Intervals conducted at a velocity halfway between lactate threshold and the velocity at $\dot{V}O_{2MAX}$ (vVO_{2MAX}).
- Continuous runs at lactate threshold.
- Training at vVO_{2MAX} .
- Training at velocities between 94-106% of vVO_{2MAX} .

Modalities to Improve Running Economy

Neuromuscular

- Explosive Training
 - Weight Lifting
 - Olympic Lifts
- Plyometrics
 - Hops and Bounds (Mimic Running Action)
 - 5 Jumps (R – L – Alternate)
 - Maximal Anaerobic Activity (20 Meters Max Speed)

Modalities to Improve Running Economy

- The object in both Metabolic and Neuromuscular Training is to:
 - Use less O_2 at a given race pace; and
 - Increase muscular power at the same time;
 - So that optimal stride length is increased and ground contact time is shortened.

Typical Training Week (Microcycle)

Below is a typical microcycle week during a 14-week marathon training:

Day	Activity
Sunday	Long Volume Day (2-3 Hours)
Monday	Recovery Day AM-PM (45 Min-1 Hr Each)
Tuesday	- Intensity - Long Intervals - 5Ks, 3Ks, 2Ks, Miles
Wednesday	Long Volume 20 Miles · Marathon Pace (4-Mile Tempo Run Within the 20 Miles)

Typical Training Week (Microcycle)

Day	Activity
Thursday	- Intensity Day - Short Intervals - 1Ks, 800s, 400s (Acceleration Run)
Friday	Recovery Day (Same As Monday)
Saturday	Major Tempo Run (20 Minutes—15 Miles)
3 Days/Week	- Core Work - Plyometrics - Weight Lifting

Typical Training Week (Microcycle)

Goal:

At least one-third of total volume in a week should be at 80-100% of vVO_2 (some at 106-120% vVO_{2MAX}).

Effective Training Categories

Please Refer to Effective Training Categories Chart

Effective Training Categories

Work Category	Aerobic One	Aerobic Two	Threshold	Aerobic Overload	Max VO_2	Supra-Maximal Oxygen Consumption
% of Max VO_2	60%	70%	80-88%	85%	100%	112% 118% 125%
% of Maximum Velocity	60%	70%	85%	85%	90%	100%
Type of Training	Removal	Base Training	Base Training	Transition Endurance Training		Anaerobic Training Max Lactate Production
Definition	Recovery Runs	Warm-Ups	Threshold Development	Aerobic Utilization	Aerobic Capacity	Race Economy
Lactate Response	Clearance	No Accumulation	Breakpoint	Production	Accumulation	
Work Time For Training Adaptation	60-90 Minutes	30 Minutes - 3 Hours	Sets of 20 Minutes or 40-70 Minutes	10K Worth of High Intensity Intervals	20-30 Minutes	400M 200M 100M
Work Sets	1 Set Sometimes Twice/Day	Medium Runs	2 or 3 Sets or 1 Long Set	Long Work Short Rest	3 Minute Alt 2 Minute SL	400-100 Meters 200-800 Meters 100-3 Minutes

Reference Point Training Base=Mile Time

Level I	Repeat Mile Times	MVO_2 T	2-Mile Times
4:00 – 4:15	85% 4:42 – 5:00 88% 4:32 – 4:50 91% 4:24 – 4:40 94% 4:15 – 4:31	9:24 9:02 8:48 8:30	10:00 – 10:00 9:40 – 9:40 9:20 – 9:20 9:02 – 9:02
Level II			
4:15 – 4:30	85% 5:00 – 5:17 88% 4:50 – 5:07 91% 4:40 – 5:00 94% 4:31 – 4:47	10:00 9:40 9:20 9:02	10:34 – 10:34 10:14 – 10:14 10:00 – 10:00 9:34 – 9:34
Level III			
4:30 – 4:45	85% 5:17 – 5:35 88% 5:07 – 5:23 91% 4:57 – 5:13 94% 4:47 – 5:03	10:34 10:14 9:54 9:34	11:10 – 11:10 10:46 – 10:46 10:26 – 10:26 10:06 – 10:06

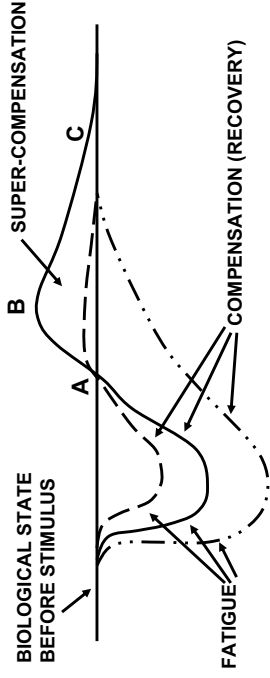
Reference Point Training Base=Mile Time

Level IV	Repeat Mile Times	MVO_2 T	2-Mile Times
4:45 – 5:00	85% 5:35 – 5:53 88% 5:24 – 5:41 91% 5:13 – 5:30 94% 5:00 – 5:16	11:10 10:48 10:26 10:00	11:46 – 11:46 11:22 – 11:22 11:00 – 11:00 10:32 – 10:32
Level V			
5:00 – 5:15	85% 5:53 – 6:10 88% 5:41 – 5:58 91% 5:30 – 5:46 94% 5:16 – 5:31	11:46 11:22 11:00 10:32	12:20 – 12:20 11:56 – 11:56 11:32 – 11:32 11:02 – 11:02
Level VI			
5:15 – 5:30	85% 6:10 – 6:28 88% 5:58 – 6:15 91% 5:46 – 6:02 94% 5:31 – 5:51	12:20 11:56 11:32 11:02	12:56 – 12:56 12:30 – 12:30 12:04 – 12:04 11:42 – 11:42

Reference Point Training Base=Mile Time

Level VII	Repeat Mile Times	MVO_2 T	2-Mile Times
5:30 – 5:45	85% 6:28 – 6:45 88% 6:15 – 6:32 91% 6:02 – 6:19 94% 5:51 – 6:07	12:56 12:30 12:04 11:42	13:30 – 13:30 13:04 – 13:04 12:38 – 12:38 12:14 – 12:14
Level VIII			
5:45 – 6:00	85% 6:45 – 7:03 88% 6:32 – 6:49 91% 6:19 – 6:35 94% 6:07 – 6:22	13:30 13:04 12:38 12:14	14:06 – 14:06 13:38 – 13:38 13:10 – 13:10 12:44 – 12:44
Altitude Adjustment			
	7-9 Seconds/Mile 4-6 Seconds/Mile 2-3 Seconds/Mile 0	7000' – 8000' 5000' – 7000' 3500' – 5000' Below 3000'	

The Management Process



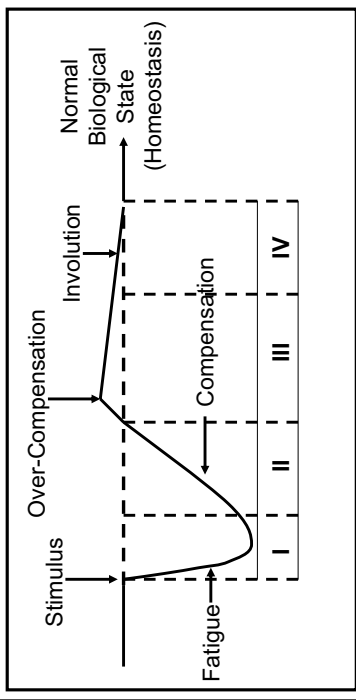
----- Training Too Easy
 _____ Training Adequate
 - - - - - Training Too Hard

New Stimulus Applied:

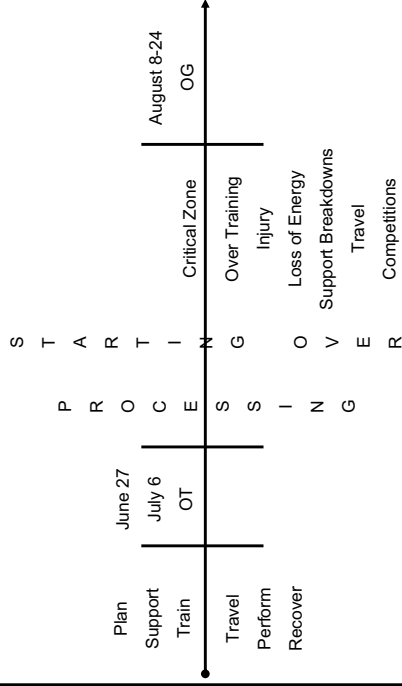
- A - Too Early
- B - On Time
- C - Too Late

Over-Compensation Cycle

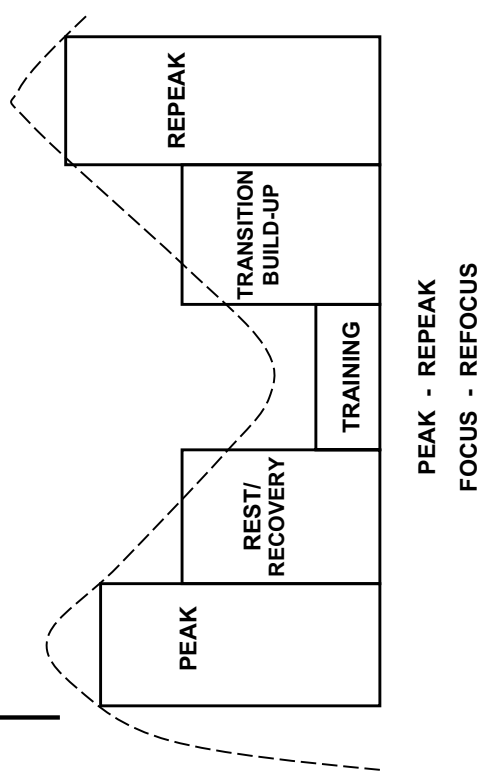
The Over-Compensation Cycle of a Training Lesson
 (Modified from Yakovlev, 1967)



The Road to Beijing



From The Trials To The Games



Prominent Distractions - A

- Between the Trials and the Games
- Friends and Family
- Media
- Travel
- Pre-Olympic Competitions
- Staging

Prominent Distractions - A

- Communications
- Equipment
- Olympic Games Protocol
- Nutrition

Prominent Distractions - B

- Environment
 - Humidity
 - Pollution
- Living Conditions and Roommates
- Medical
 - Illness and Injury
 - Drug Testing

Prominent Distractions - B

- Support Team
 - Personal and Team Coaches, Agents, etc.
- Training and Race Plans
- Stadium/Race Course