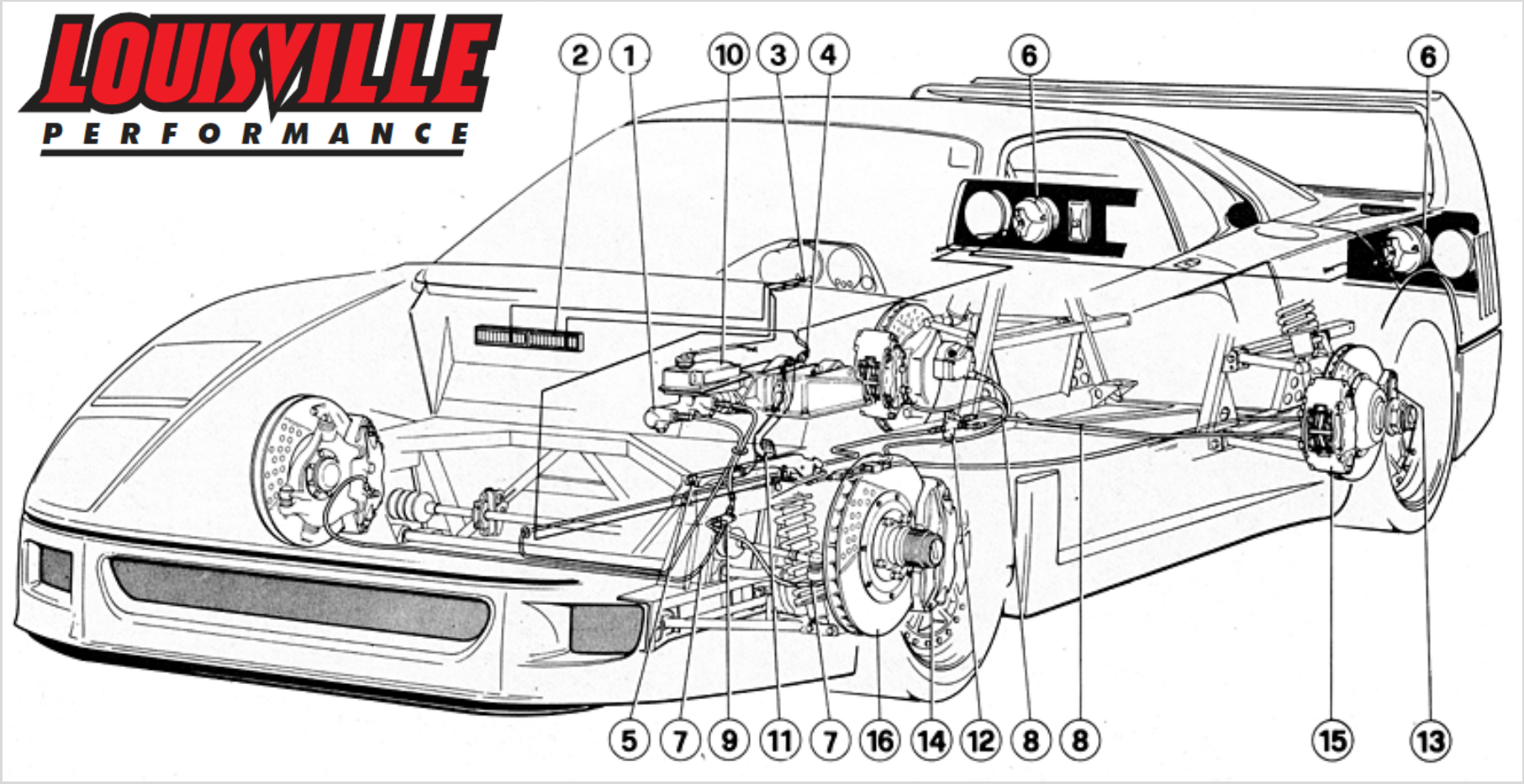
TEAM SPORTS CONDITIONING OWNER'S MANUAL



STRENGTH/POWER VS. CONDITIONING

ENDURANCE SPORTS VS. TEAM SPORTS

OVERVIEW – 4 "P's"

I. PHILOSOPHY

II. PRINCIPLES & PROGRESSIONS

III. PERIODIZATION

PHILOSOPHY

#1 - IDENTIFICATION

**We identify specific metabolic qualities and use volume/intensity guidelines to target those during fitness training*

PHILOSOPHY

#2- AEROBIC DEVELOPMENT

**We place a heavy emphasis on fully developing the capacity of the aerobic system*

PHILOSOPHY

ENERGY SYSTEM RELATIVE CONTRIBUTION:

Table II. Estimates of anaerobic and aerobic energy contribution during selected periods of maximal exercise

Duration of exhaustive exercise (sec)	% Anaerobic	% Aerobic
0-10	94	6
0-15	88	12
0-20	82	18
0-30	73	27
0-45	63	37
0-60	55	45
0-75	49	51
0-90	44	56
0-120	37	63
0-180	27	73
0-240	21	79

Gastin, P.B. Energy system interaction and relative contribution during maximal exercise. Sports Med. 31 (10): 725-741. 2001.

PHILOSOPHY

CENTRAL VS. PERIPHERAL

Oxygen ***transport/delivery***
**Responds best to intensity*
**Adaptation occurs in 4-6 weeks*

- Stroke Volume
- Myocardial Contractility
- Autonomic Regulation
- Pulmonary Diffusion
- Blood Volume
- Hemoglobin Affinity

Oxygen ***utilization/efficiency***
**Responds best to volume*
**Adaptation occurs within 4-6 months*

- Oxidative Enzymes
- Mitochondrial Density
- Mitochondrial Enzymes
- Capillary Density
- Muscle Glycogen Stores
- Myoglobin

**A New Perspective on Energy Systems and Performance, Joel Jamieson*

PHILOSOPHY

"…***Central circulatory performance*** (stroke volume, cardiac output, myocardial contractility, etc.) might respond (and saturate) rapidly to increases in training intensity, whereas changes in ***skeletal muscle adaptations*** (mitochondrial volume, capillary density, aerobic enzyme production, etc.) may take weeks or months to saturate.

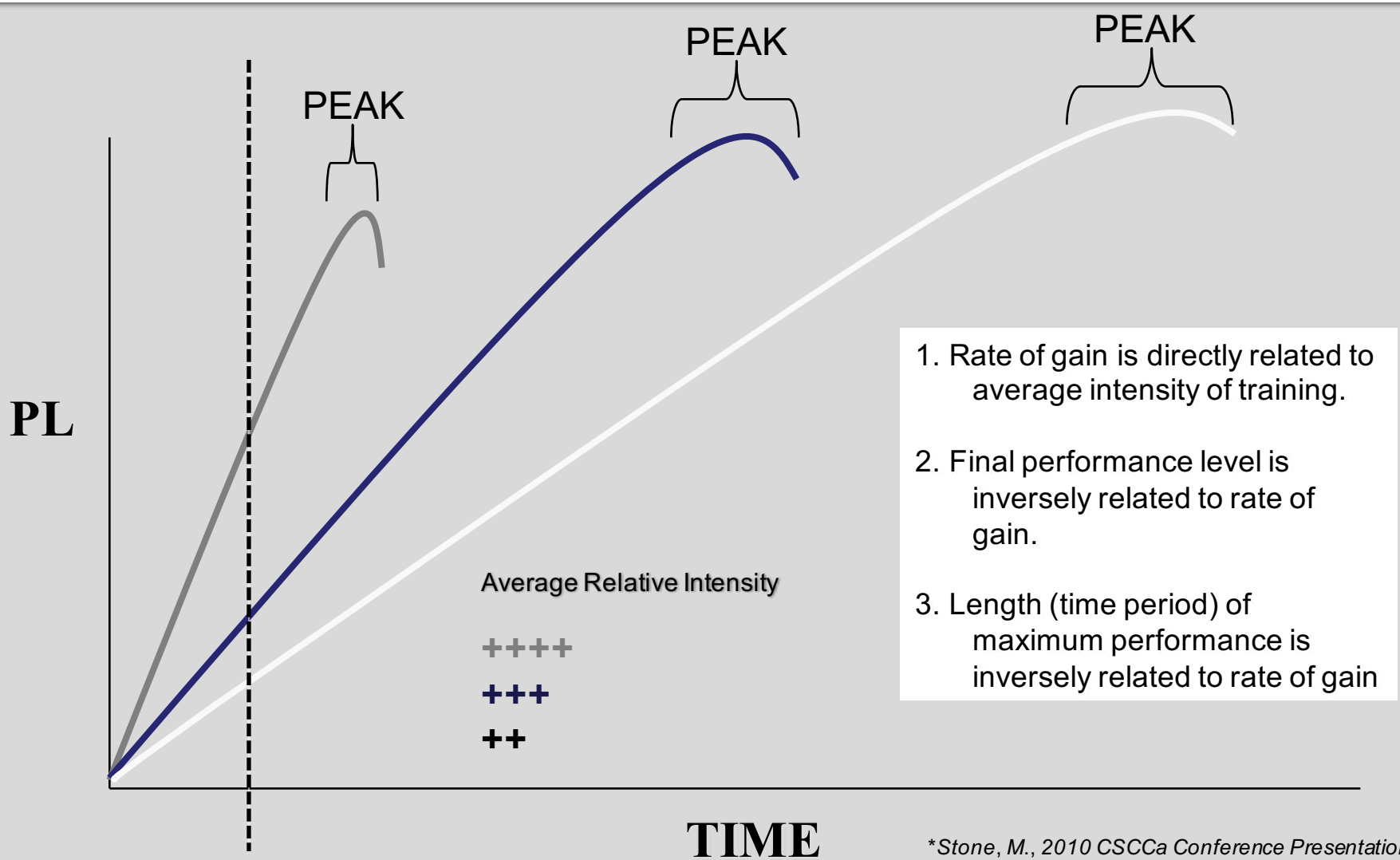
**Impact of Training Intensity Distribution on Performance in Endurance Athletes, Esteve-Lanao, et al., 2007*

PHILOSOPHY

"…From the perspective of adaptation induction, ***substantial volumes of low-intensity training*** coupled with ***small volumes of high-intensity training*** may provide an effective combination of stimuli for both ***peripheral*** and ***central*** adaptation."

**Impact of Training Intensity Distribution on Performance in Endurance Athletes, Esteve-Lanao, et al., 2007*

THEORETICAL RATES OF ADAPATION

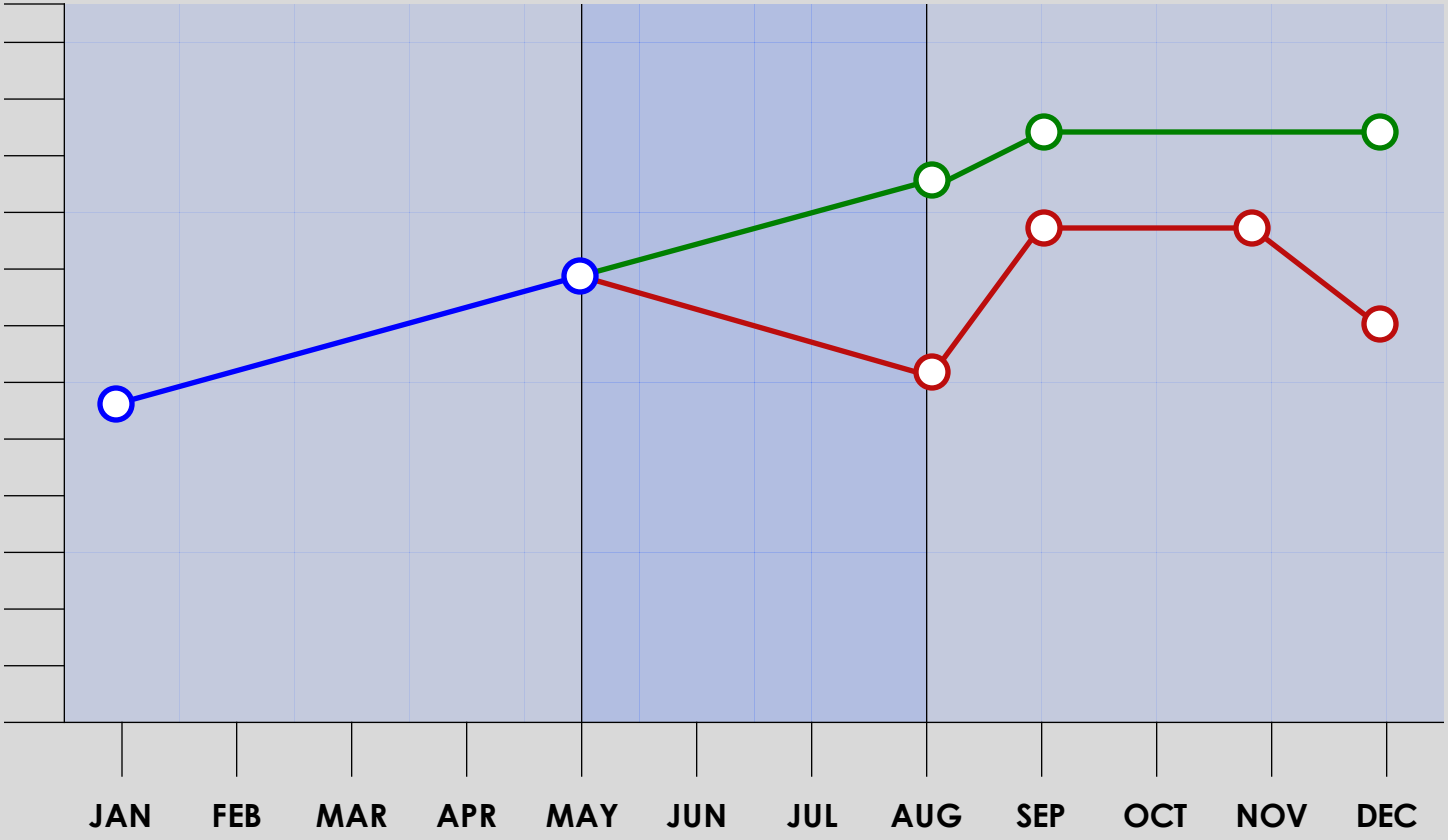


1. Rate of gain is directly related to average intensity of training.
2. Final performance level is inversely related to rate of gain.
3. Length (time period) of maximum performance is inversely related to rate of gain

*Stone, M., 2010 CSCCa Conference Presentation

THEORETICAL RATES OF ADAPATION

IN-SEASON FITNESS TREND: FIT vs. UNFIT

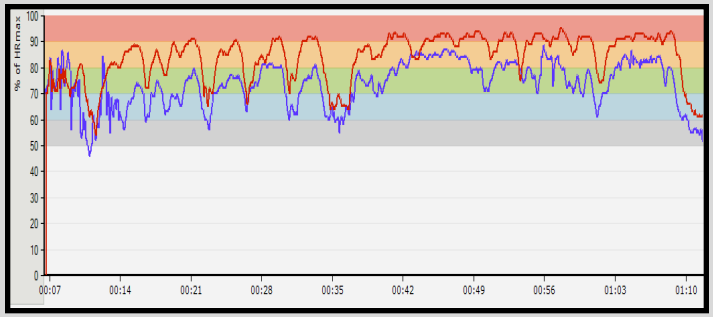


PHILOSOPHY

How do we handle unfit players during pre-season?

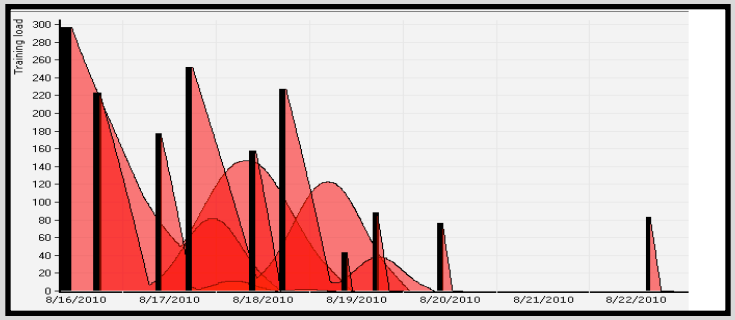
UNFIT PLAYERS:

Experience highest daily training loads



+

Will be under-recovered from practice sessions



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INCREASED RISK OF INJURY AND OVERTRAINING!

PHILOSOPHY

How do we handle unfit players during pre-season?

✓ **EXTRA HIGH-INTENSITY CONDITIONING IS NOT THE ANSWER!!!**

1. Supplement Aerobic Threshold (A-1) bike workouts to safely increase aerobic capacity

2. Supplement high-intensity interval training as long as it is a substitute for practice minutes

3. Limit minutes during pre-season and early-season games

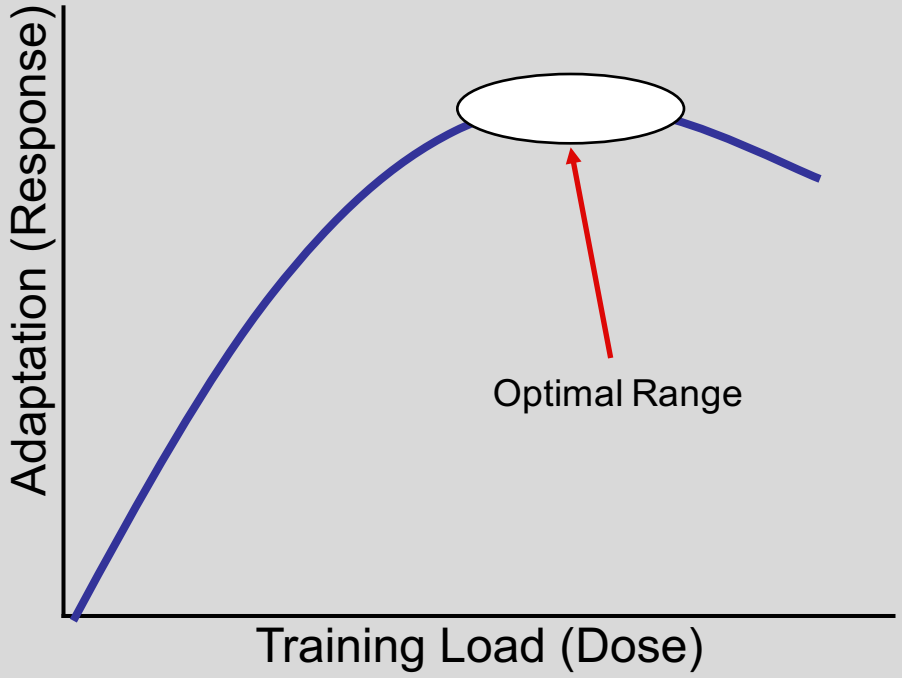
PHILOSOPHY

#3 - MINIMUM EFFECTIVE DOSE

** the minimum amount of volume necessary to achieve desired adaptation*

PHILOSOPHY

"Studying dose response, and developing dose response models, is central to determining 'safe' and 'hazardous' levels and dosages for drugs, potential pollutants, and other substances"



**Basic and Clinical Pharmacology, 12th Ed., B. Katzung*

PHILOSOPHY

Is this always the goal???

OVERVIEW

PART II.

PRINCIPLES & PROGRESSIONS

TRAINING LEVELS

Terminology?

Aerobic Overload

General Endurance

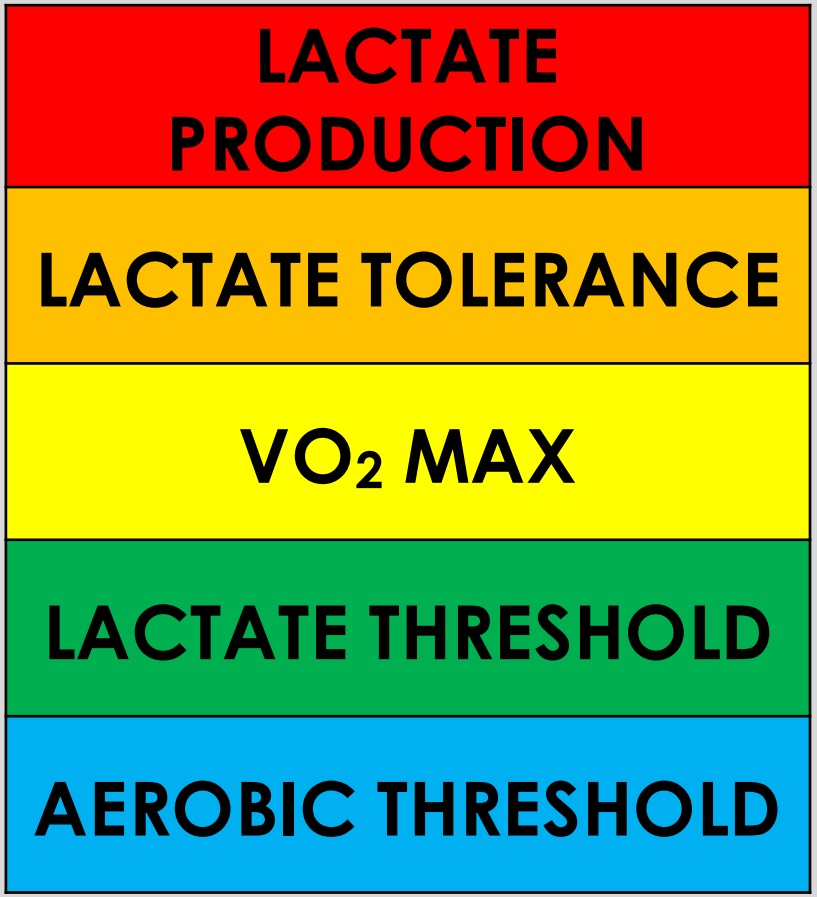
Power Endurance

AEROBIC BASE

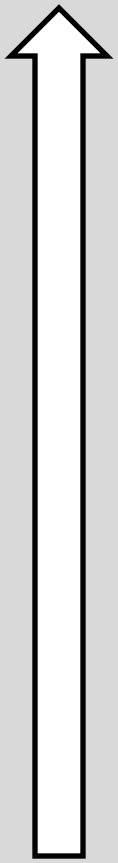
Lactic Intervals

Aerobic Strength

Cardiac Power



TRAINING LEVELS



PURE SPEED — 1-6sec

SUSTAINED SPEED — 6-20sec

LACTATE PRODUCTION

LACTATE TOLERANCE

VO_2 MAX

LACTATE THRESHOLD

AEROBIC THRESHOLD

TRAINING LEVELS

GAUGING TRAINING INTENSITY:

Heart Rate (% of Max)

Velocity (vVO_2 or Peak Velocity)

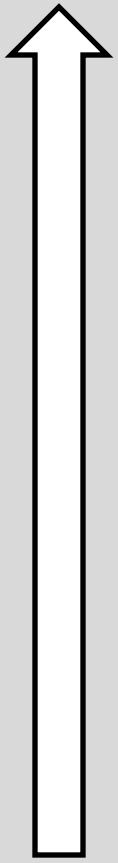
Rating of Perceived Exertion (RPE)

RATING OF PERCEIVED EXERTION (RPE)

6	No exertion at all	
7	Extremely light	
8		
9	Very light	*No effort required to speak
10		
11	Light	*Can carry on a conversation
12		
13	Somewhat hard	*Can speak in sentences
14		
15	Hard	*Can speak a sentence
16		
17	Very hard	*Can speak a phrase
18		
19	Extremely hard	*Can speak a word
20	Maximal exertion	*Can't speak

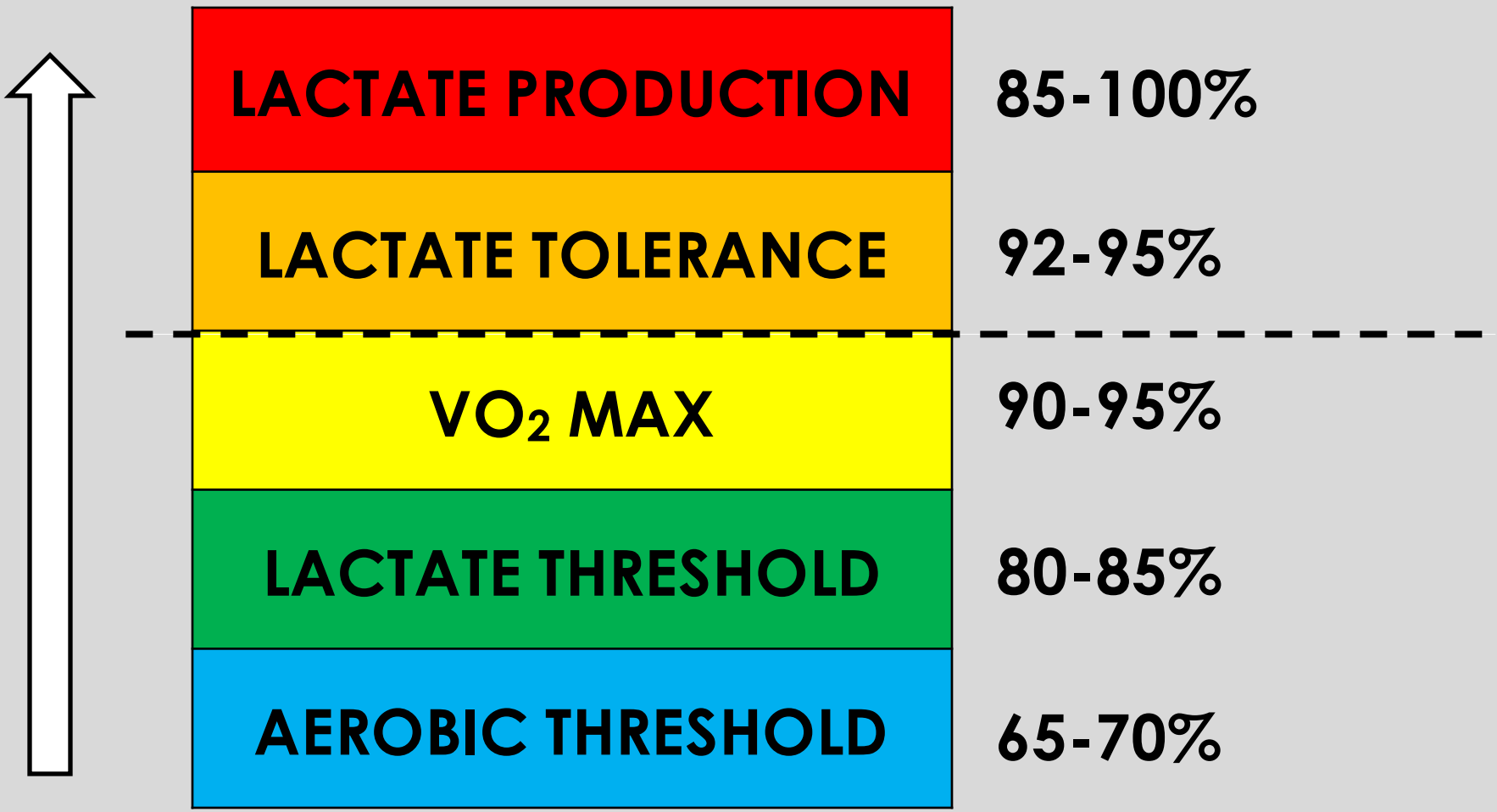
TRAINING LEVELS – Defined

The work rate/intensity at which:

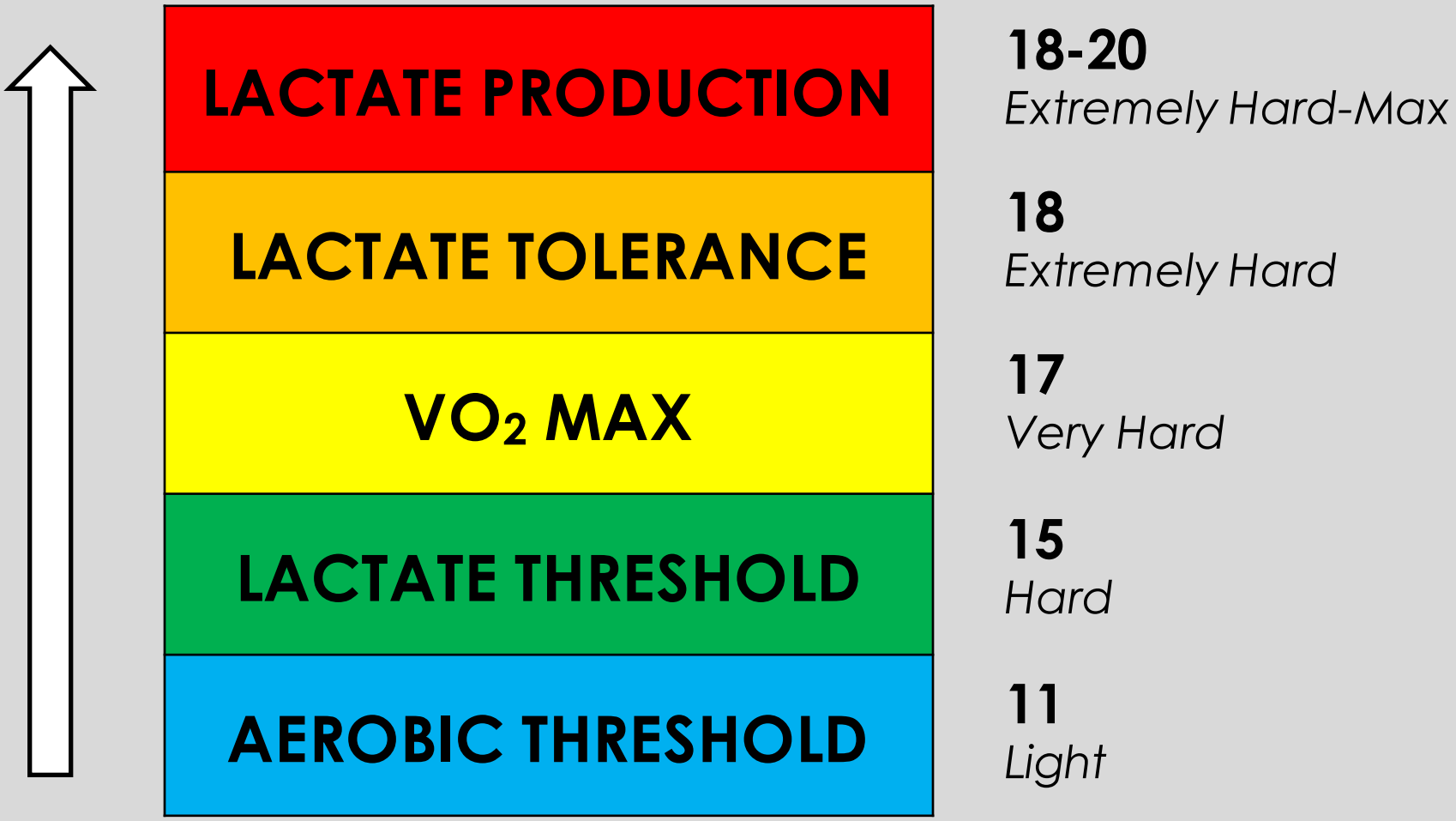


LACTATE PRODUCTION	*Peak lactates are achieved*
LACTATE TOLERANCE	*High lactate levels can be sustained*
VO_2 MAX	*Maximal Oxygen Uptake*
LACTATE THRESHOLD	*Muscle lactate production exceeds removal rate*
AEROBIC THRESHOLD	*1mmol lactate over resting*

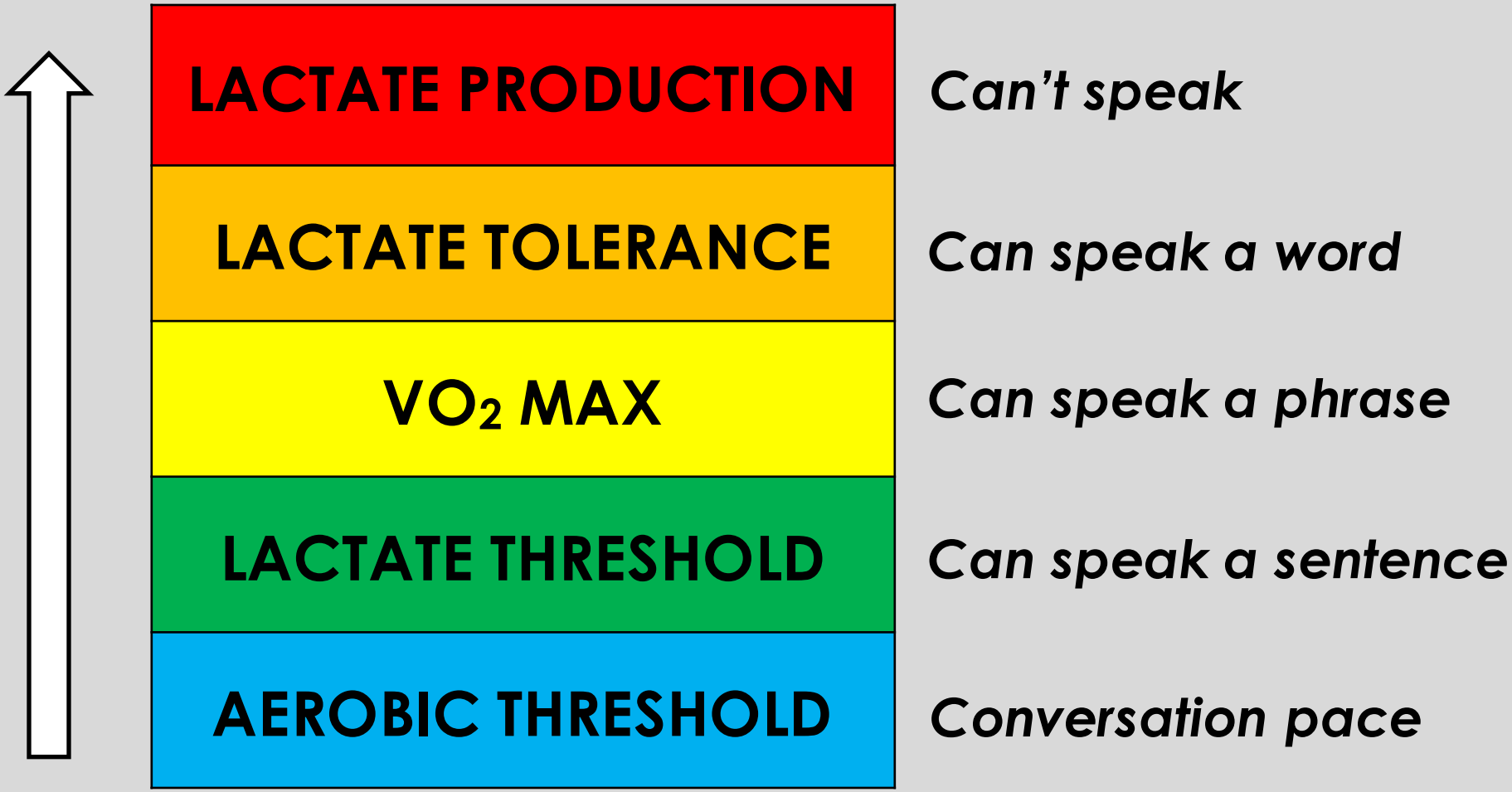
TRAINING LEVELS – % HR Max



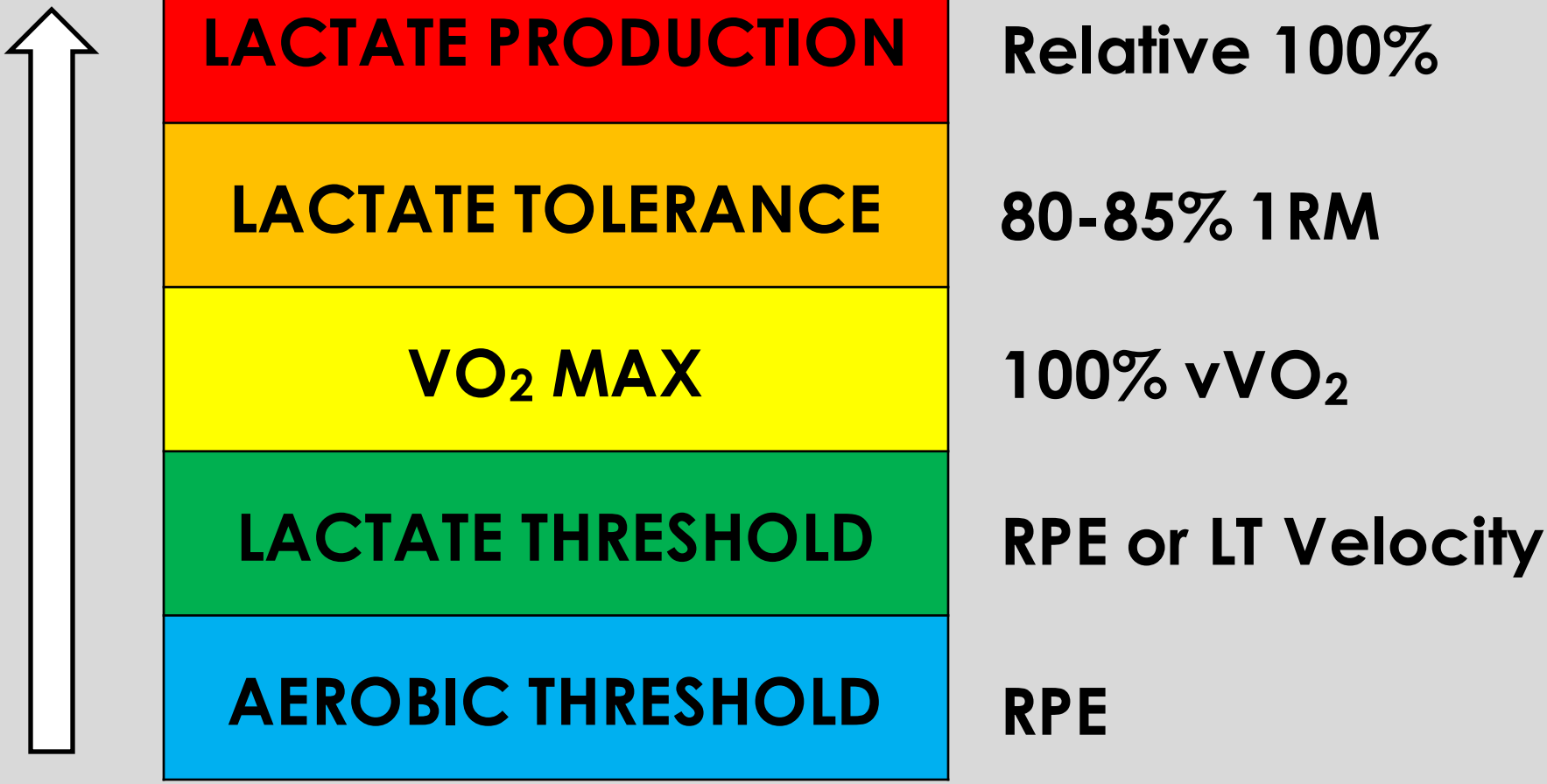
TRAINING LEVELS - RPE



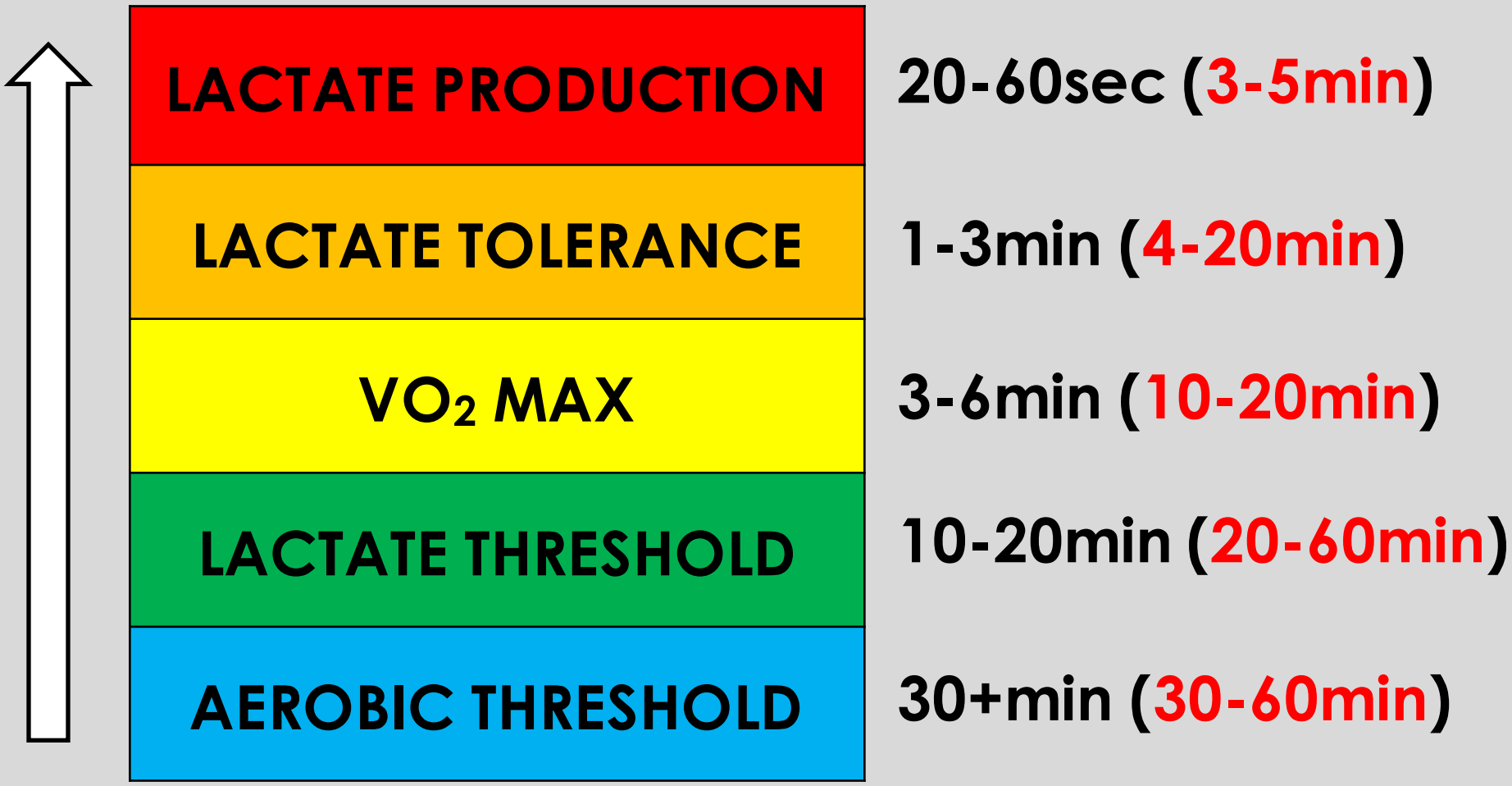
TRAINING LEVELS – BREATHING



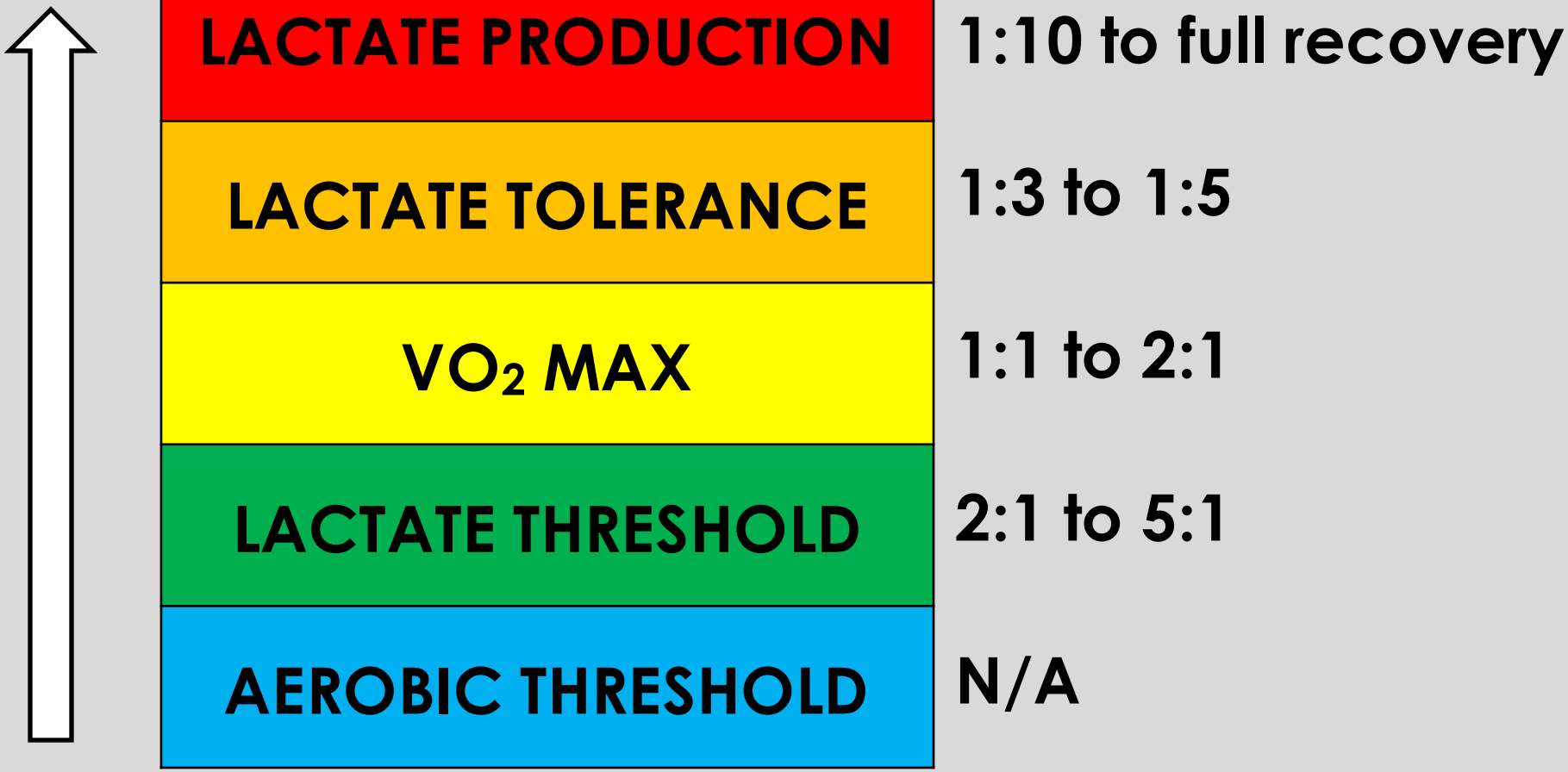
TRAINING LEVELS – VELOCITY



TRAINING LEVELS – DURATION



TRAINING LEVELS – WORK:REST



AEROBIC THRESHOLD

PROGRESSION

- ✓ 1-2 Sets of 30-90min
- ✓ At least 30min total work volume

LACTATE THRESHOLD

PROGRESSION

LOW VOLUME	HIGH VOLUME
2x10:00	3x10:00
2x12:00	3x12:00
2x15:00	3x15:00
2x18:00	3x18:00
2x20:00	3x20:00

- ✓ 2-3 sets of 10-20min
- ✓ Between 20-60min of total work volume

VO_2 MAX

PROGRESSIONS – LONG INTERVALS

3:00 INTERVAL	4:00 INTERVAL
3x3:00	3x4:00
4x3:00	4x4:00
5x3:00	5x4:00
6x3:00	6x4:00
5:00 INTERVAL	**6:00 INTERVAL**
3x5:00	2x6:00
4x5:00	3x6:00
5x5:00	4x6:00
6x5:00	5x6:00

- ✓ 3-6 Sets of 3-6min w/1:1 to 3:1 work:rest
- ✓Between 10-20min of total work volume

VO_2 MAX

PROGRESSIONS – SHORT INTERVALS

30/30 -- 60/60
2x8:00
2x10:00
2x12:00
1x15:00
1x20:00

- ✓ 1-2 Sets of 6-20min of 30/30 or 60/60
- ✓ Between 10-20min of total work volume

LACTATE TOLERANCE

PROGRESSION

✓ 3-10 sets of 1-3min

Low volume: 4 x (1min/3min) @ 85%
High volume: 10 x (1min/1min) @ 80%
1min = 400m

Low volume: 2 x (3min/3min) @ 85%
High volume: 6 x (3min/1min) @ 80%
3min = 800m


Second Edition
RunningTrax
Computerized Running Training Programs
J. Gerry Purdy, Ph.D.

SCORING TABLES – 400m ex.

TIME	POINTS	TIME	POINTS	TIME	POINTS	TIME	POINTS	TIME	POINTS
50.0	767	1:01	538	1:22	339	1:43	222	2:04	145
50.5	747	1:02	525	1:23	332	1:44	218	2:05	142
51.0	729	1:03	513	1:24	325	1:45	213	2:06	139
51.5	713	1:04	501	1:25	319	1:46	209	2:07	136
52.0	699	1:05	490	1:26	312	1:47	205	2:08	133
52.5	685	1:06	478	1:27	306	1:48	201	2:09	130
53.0	673	1:07	468	1:28	300	1:49	197	2:10	127
53.5	661	1:08	457	1:29	294	1:50	193	2:11	124
54.0	651	1:09	447	1:30	288	1:51	189	2:12	122
54.5	640	1:10	437	1:31	282	1:52	185	2:13	119
55.0	631	1:11	428	1:32	277	1:53	182	2:14	116
55.5	622	1:12	419	1:33	271	1:54	178	2:15	114
56.0	613	1:13	410	1:34	266	1:55	174	2:16	111
56.5	604	1:14	401	1:35	260	1:56	171	2:17	109
57.0	596	1:15	393	1:36	255	1:57	167	2:18	106
57.5	588	1:16	384	1:37	250	1:58	164	2:19	104
58.0	580	1:17	376	1:38	245	1:59	161	2:20	101
58.5	573	1:18	368	1:39	240	2:00	157	2:21	99
59.0	566	1:19	361	1:40	236	2:01	154	2:22	97
59.5	559	1:20	353	1:41	231	2:02	151	2:23	94
1:00	552	1:21	346	1:42	226	2:03	148	2:24	92

PACING TABLES – 400m ex.

Percent Performance	Reps	Rest	100m	150m	200m	250m	300m	350m	400m
100.0%	0-1	---	14.9	22.7	30.9	40.3	50.5	1:01.8	1:14.1
95.0%	1-2	5-7min	15.7	23.9	32.5	42.4	53.2	1:05.0	1:18.0
90.0%	2-3	4-5min	16.5	25.3	34.3	44.7	56.1	1:08.6	1:22.4
85.0%	4-5	3-4min	17.5	26.7	36.3	47.4	59.4	1:12.7	1:27.2
82.5%	6-7	2-3min	18.0	27.6	37.4	48.8	1:01.2	1:14.9	1:29.8
80.0%	8-9	1-2min	18.6	28.4	38.6	50.3	1:03.2	1:17.2	1:32.7
77.5%	10-12	1-2min	19.2	29.3	39.8	52.0	1:05.2	1:19.7	1:35.6
75.0%	13-15	1-2min	19.8	30.3	41.2	53.7	1:07.4	1:22.3	1:38.8
72.5%	16-18	.5-1min	20.5	31.4	42.6	55.5	1:09.7	1:25.2	1:42.2
70.0%	19-21	.5-1min	21.3	32.5	44.1	57.5	1:12.2	1:28.2	1:45.9

Percent Performance	Reps	Rest	500m	600m	800m	1000m	1200m	1500m	Mile
100.0%	0-1	---	1:36	1:59	2:50	3:36	4:25	5:42	6:09
95.0%	1-2	5-7min	1:41	2:05	2:59	3:48	4:39	6:00	6:29
90.0%	2-3	4-5min	1:46	2:12	3:08	4:00	4:54	6:20	6:50
85.0%	4-5	3-4min	1:53	2:20	3:20	4:15	5:12	6:42	7:14
82.5%	6-7	2-3min	1:56	2:24	3:26	4:22	5:21	6:54	7:27
80.0%	8-9	1-2min	2:00	2:28	3:32	4:30	5:31	7:07	7:41
77.5%	10-12	1-2min	2:03	2:33	3:39	4:39	5:42	7:21	7:56
75.0%	13-15	1-2min	2:08	2:38	3:46	4:48	5:53	7:36	8:12
72.5%	16-18	.5-1min	2:12	2:44	3:54	4:58	6:06	7:52	8:29
70.0%	19-21	.5-1min	2:17	2:50	4:02	5:09	6:19	8:08	8:47

LACTATE PRODUCTION

All efforts should be performed at:

a. Maximal or near-maximal velocity for the assigned distance
b. 90%+ of 1RM (peak) velocity
c. RPE of 19-20
d. Blood lactate level range of 10-20mmol

** Heart rate may range from 85-100%*

LACTATE PRODUCTION

EXAMPLES

a. 200m Sprints (2-3 sets of 3-6 reps)
b. Bike Sprints (high gear x 20-60s efforts)
c. Sled Push/Pull/Drag (20-60s efforts)
d. Hill Sprints (20-60s efforts)

✓Between 3-5min of total work volume

OVERVIEW

PART III.

PERIODIZATION

PERIODIZATION

1. Start backwards.

- ✓ *Know the end goal*
- ✓ *Sport/positional needs analysis*

**Science of Running, Steve Magness*

PERIODIZATION

2. Work the extremes.
3. Bring it together.

- ✓ *Technique/speed development*
- ✓ *Aerobic threshold*

- ✓ *Fartlek (intermix intensities)..build toward game volumes*

**Science of Running, Steve Magness*

PERIODIZATION

4. Never leave anything behind.

- ✓ *"Build and maintain"*
- ✓ *Avoid neglect for extended periods of time*
- ✓ *Everything is included, emphasis changes*

**Science of Running, Steve Magness*

PERIODIZATION

5. Progress everything.

- ✓ *Progressive overload*
- ✓ *Volume, speed, decreased recovery, distance, pre-fatigue*

**Science of Running, Steve Magness*

OFF-SEASON PERIODIZATION: 3-DAY/WEEK

FALL SPORT	AEROBIC THRESHOLD	LACTATE THRESHOLD	VO2 MAX	LACTATE TOLERANCE	LACTATE PRODUCTION
PHASE 1 (DEC): 4-6 WEEKS	2	1			
PHASE 2 (JAN): 4-6 WEEKS	1	2			
PHASE 3 (FEB): 4-6 WEEKS		2	1		
PHASE 4 (MARCH): 4-6 WEEKS		1	1	1	
PHASE 5 (APRIL): 4-6 WEEKS			1	1	1
PHASE 6 (MAY): 4-6 WEEKS	1	1	1		
PHASE 7 (JUNE): 4-6 WEEKS		1	2		
PHASE 8 (JULY): 4-6 WEEKS			1	2	

OFF-SEASON PERIODIZATION: 4 DAY/WEEK

FALL SPORT	AEROBIC THRESHOLD	LACTATE THRESHOLD	VO2 MAX	LACTATE TOLERANCE	LACTATE PRODUCTION
PHASE 1 (DEC): 4-6 WEEKS	3	1			
PHASE 2 (JAN): 4-6 WEEKS	2	2			
PHASE 3 (FEB): 4-6 WEEKS	1	2	1		
PHASE 4 (MARCH): 4-6 WEEKS		1	2	1	
PHASE 5 (APRIL): 4-6 WEEKS		1	1	1	1
PHASE 6 (MAY): 4-6 WEEKS	1	2	1		
PHASE 7 (JUNE): 4-6 WEEKS		1	2	1	
PHASE 8 (JULY): 4-6 WEEKS		1	1	2	

THANK YOU!

- **CSCCa**
- **Louisville Sports Performance Staff**
- **Attendees**

Contact Information:
jasond@gocards.com
www.gocards.com/sportsperformance

OVERVIEW

PART IV.

PROFILING

TESTING PHILOSOPHY

WHY DO WE TEST & HOW DO WE CHOOSE OUR TESTS?

OLD MODEL

- One finishing time or score
- Pass/Fail (according to generic team standards)
- Historically popular/common tests (i.e. mile run)

NEW MODEL

- Obtain meaningful data (heart rate, velocity, recovery %'s)
- Use results to plan individual training intensities
- Measure physiological capacities
- Profile individual strengths and weaknesses

TYPES OF TESTS

METABOLIC QUALITIES TO BE IDENTIFIED:

- **POWER**: The rate at which energy can be turned over
- **CAPACITY**: The total amount of energy that can be turned over

- **ANAEROBIC POWER**
- **ANAEROBIC CAPACITY**
- **AEROBIC POWER**
- **AEROBIC CAPACITY**

ANAEROBIC POWER

- **DEFINITION: The highest power output produced between 1-5 seconds**

- **PARAMETERS**
  - **1-Repetition Maximal Effort**
  - **< :05 Seconds**
  - **Measured in Watts (W)**
- **TESTS**
  - **Vertical Jump (Harman equation)**
  - ***Peak Power (W) = 61.9 x Jump Ht. (cm) + 36.0 x BW (kg) + 1,822***

  - **35-Meter Sprint**
  - ***Peak Power (W) = BW (kg) x Distance^2 / Time^3***

  - **Wingate Test (peak power taken from first :05 seconds)**
  - ***Peak Power (W) = (RPM x 1.615m) x (Resistance (kg) x 9.8)***

ANAEROBIC CAPACITY

- **DEFINITION: The highest power output produced between 30-60 seconds**

- **PARAMETERS**
  - **30-60 Second Maximal Effort**
  - **Sport-Specific: Running, Cycling, Rowing, etc.**
  - **Repeated Efforts (w/minimal rest)**
  - ***Measure Peak & Average Power (watts per kg)***
  - ***Measure Fatigue Index (loss of power in watts/sec)***

- **TESTS**
  - **Running-Based Anaerobic Sprint Test (RAST)**
    - *6 x 35-meter sprint*
    - *10 second rest between reps*
  - **Bosco Repeated Jump Test**
    - *60 continuous maximal jumps (Jump Mat)*

AEROBIC POWER: VELOCITY AT VO_2 MAX (vVO_2)

DEFINITION: The maximal velocity (power) sustained for 5-6 minutes

- Takes into account both VO_2 max and running economy
- More correlated with performance than VO_2 max alone
- Most important value in prescribing training intensities
- Also known as Maximal Aerobic Speed or Maximal Aerobic Velocity
- Average athlete can maintain VO_2 max for 6-minutes (Billat, 1991)

6-Minute Test:

- Cover maximum distance in 6-minutes
- Distance covered/6-minutes = vVO_2 max

AEROBIC CAPACITY (VO_2 MAX)

DEFINITION: The highest amount of oxygen a person can consume (per unit time & bodyweight)

- **PARAMETERS**
  - **12-15:00-Minutes**
  - **Incremental Exercise Intensity**
  - **Maximum Heart Rate**

- **TESTS**
  - **20-Meter Multistage Shuttle Run (Beep Test)** (Leger and Lambert 1982; Ramsbottom et.al. 1987)
  - **30-15 Intermittent Fitness Test (IFT)**
  - **3000-Meter Run** (Daniels, 1984)

TESTING CONSIDERATIONS

FACTORS AFFECTING PERFORMANCE:

- MOTIVATION
- ENVIRONMENTAL CONDITIONS
- TESTING SURFACE
- READINESS (SLEEP/NUTRITION/RECOVERY)
- TESTING ORDER