

Speed Training and the Endurance Runner



Michigan Coaches Clinic
November 2009

Which of the Following Statements Are Supported by Peer-Reviewed Scientific Evidence?

1. Consuming too much sugar causes children to be hyperactive.
2. Caffeine is an athletic performance inhibitor.
3. White flour has little nutritional value.
4. An average (adult) person should drink 8 glasses of water per day.
5. Anaerobic (speed) training for distance runners should be mainly done over the last half of a running season.

Misconceptions About Doing Anaerobic (Speed) Sessions Too Early in the Season.

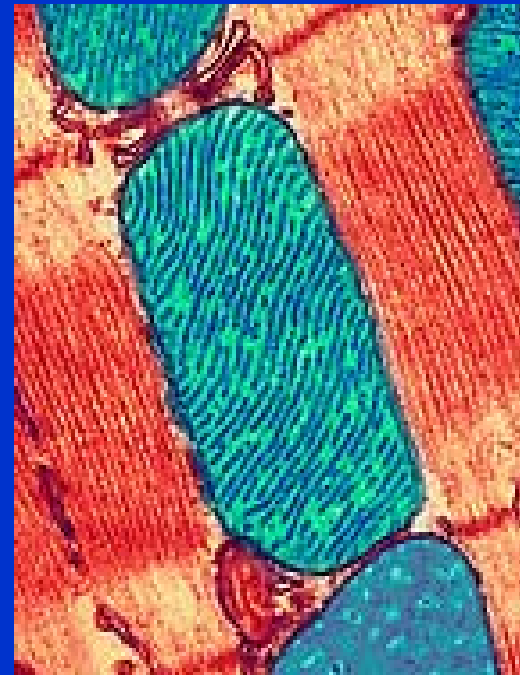
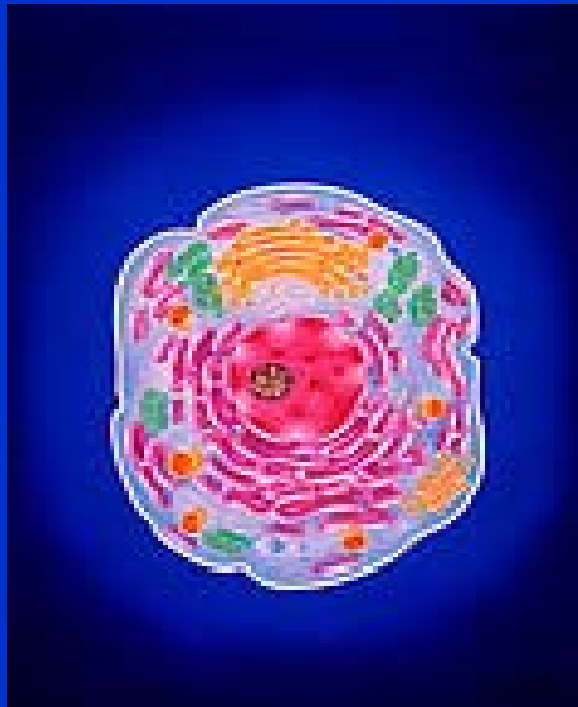
- Causes injury
- Gets athlete ready too soon
- Not a good use of time
- Weather not right
- Not a traditional model

Reasons for Doing Anaerobic (Speed) Sessions Throughout the Macrocycle

- Strength gains
- Buffering gains
- Economy gains
- Heart structure improvement
- Quicker ground mechanics



Energy Release in the Cell



Improvements in Ground Contact Time

If a distance runner can lessen their ground contact time by .02 seconds per stride, with all else being equal, there should be a ~15 second improvement in 3200 meter performance.

Ralph Mann

Speed Introduction

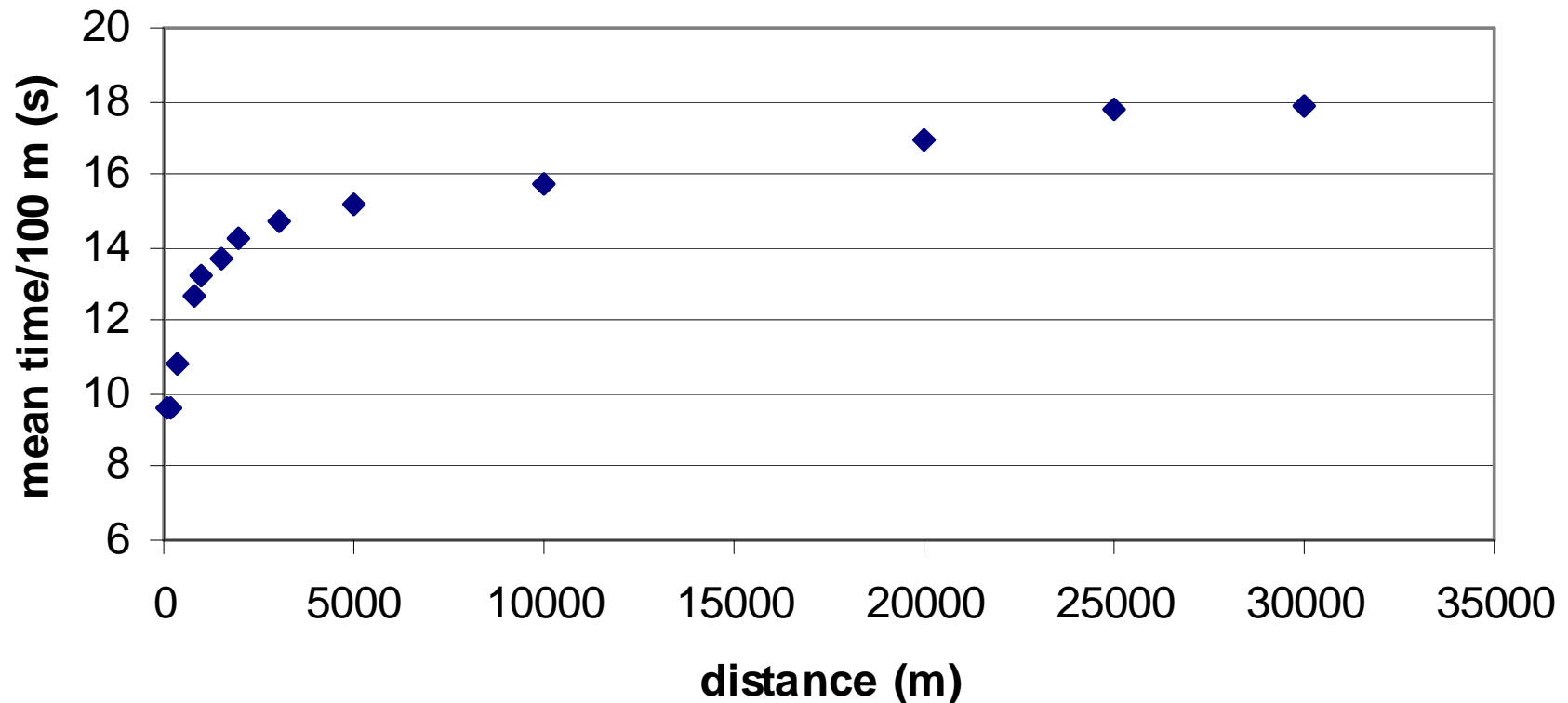
- Maximum speed is not a factor in all races.
- Speed endurance is a factor in all races.
- The anaerobic energy system has two parts – alactic and glycolytic.
- The aerobic system has one annual peak.
- The anaerobic system can achieve many peaks.
- All training is exact.

Mean Time per 100 m for
Men's Track World Records

d	r
100	9.58
200	9.59
400	10.8
800	12.64
1000	13.2
1500	13.73
2000	14.24
3000	14.69
5000	15.15
10000	15.78
20000	16.93
25000	17.74
30000	17.86

Sprinters vs. Distance Runners [Rate vs. Economy]

Mean Time per 100 m vs. Distance



Anaerobic Limitations

1. Fuel shortage in the cell
2. Acidosis in the cell

Both of these factors can be altered through training



Maximum Speed Cannot Be Maintained Even in the 100 Meters

V=m/s	Carl 1988	Mo 2001	Asafa '05	Bolt 2008
0-10m	5.29	5.46	5.29	5.41
10-20m	9.35	10.00	9.80	9.80
20-30m	10.64	10.87	10.87	10.99
30-40m	11.24	11.24	11.63	11.49
40-50m	11.63	11.63	11.76	11.76
50-60m	12.05	12.05	11.76	12.20
60-70m	11.76	12.05	11.90	12.20
70-80m	11.76	11.63	11.89	12.20
80-90m	11.63	11.24	11.76	12.05
90-100m	11.36	10.99	11.76	11.11

Where does the fuel come from in running 100 meters?

[Maximum effort]

- ATP
- CP
- Carbohydrate

Energy Source for 100 Meter Sprint

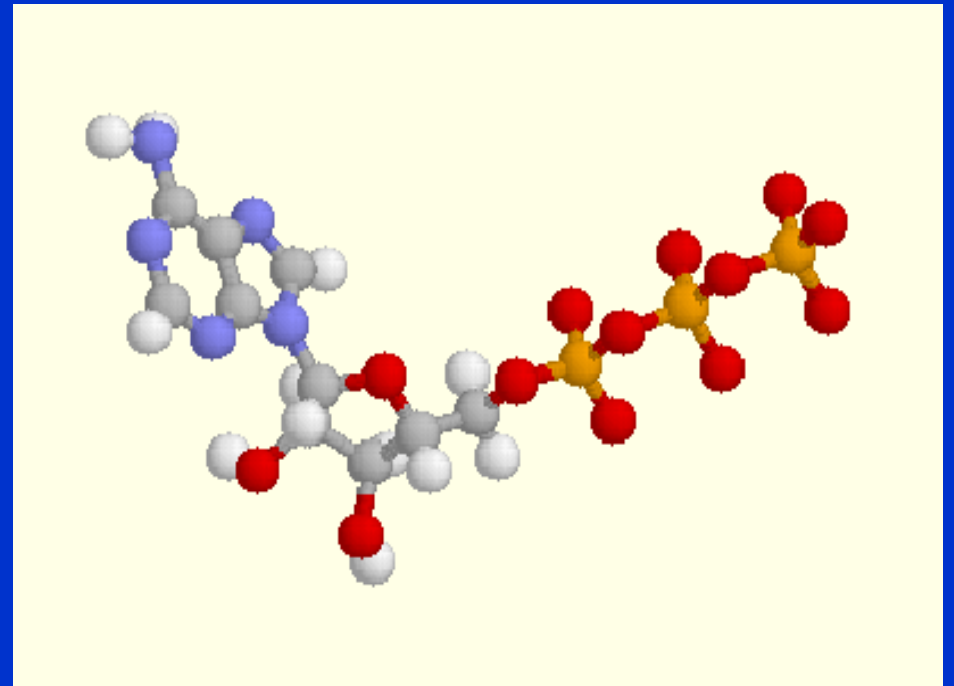
9.86 (Lewis 1991) [60mmol/kg required]

Newsholme, MSSE, 1993

	mmol/kg present at start	mmol/kg present after	mmol/kg net used
Cellular ATP	5 mmol/kg	5 mmol/kg	0 mmol/kg
Creatine Phosphate	25 mmol/kg	7 mmol/kg	18 mmol/kg
Carbohydrate (as glucose)	56 mmol/kg	18 mmol/kg	42 mmol/kg

Anaerobic Energy Zones

- **Anaerobic alactic** using PCr to ATP fuel shuttle.
- **Anaerobic glycolytic** using carbohydrate to ATP as the fuel shuttle.



Alactic Energy Zone

- No hydrogen ion build up
- 7- 9 seconds in duration
- Limited by fuel reserve
- Fuel restored at sub-maximal velocity “on the fly”
- Used for starts, surges, finish

Alactic Adaptations

- Increase storage capabilities of fuel
- Recover fuel more quickly
- Great strength work (4x force application of VO_2 max pace)



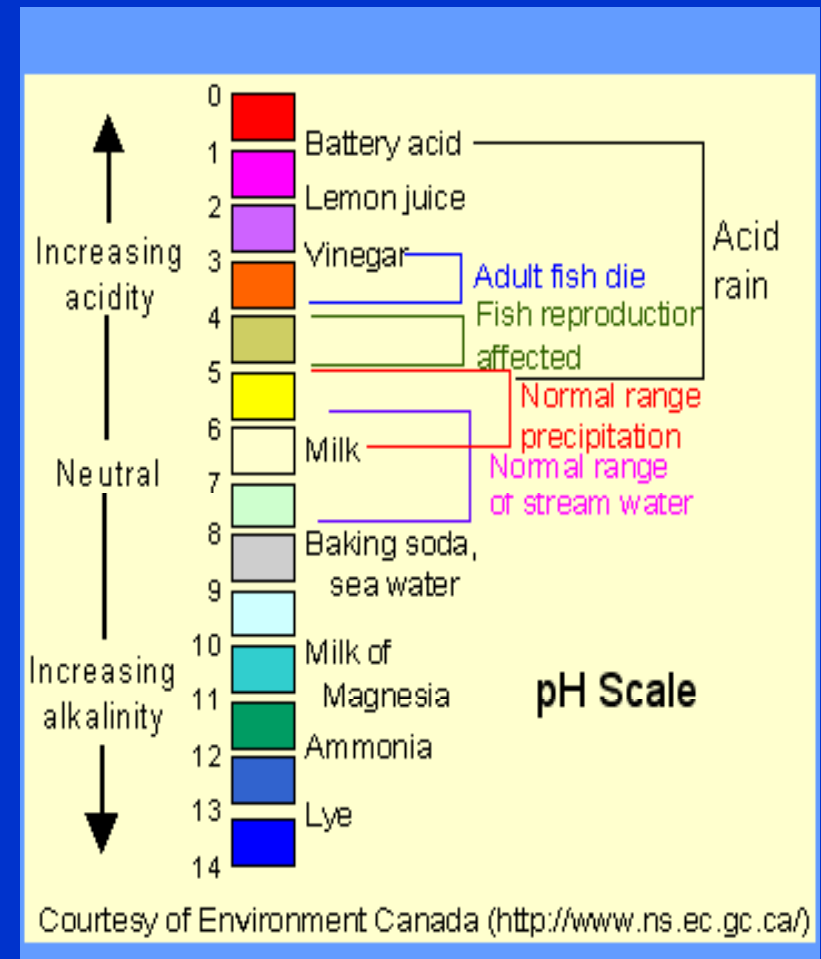
Alactic Training Parameters

- Flying 30 meter repeats
- 3-4 minutes rest between
- Do up to 15 reps



Glycolytic Energy Zone

- Hydrogen ion build-up
- 10 seconds to 2 minutes
- Acidosis is end result
- Recovery is lengthy
- Efficiency vs. capacity



Glycolytic Adaptations

- Increased hydrogen ions tolerance
- Faster clearing of hydrogen ions
- Greater running economy



Glycolytic Training Parameters

- **Efficiency** work done first 2/3 of season
- **Capacity** work done last 1/3 of season
- **Efficiency** work done as interval runs
- **Capacity** work done as repetition runs



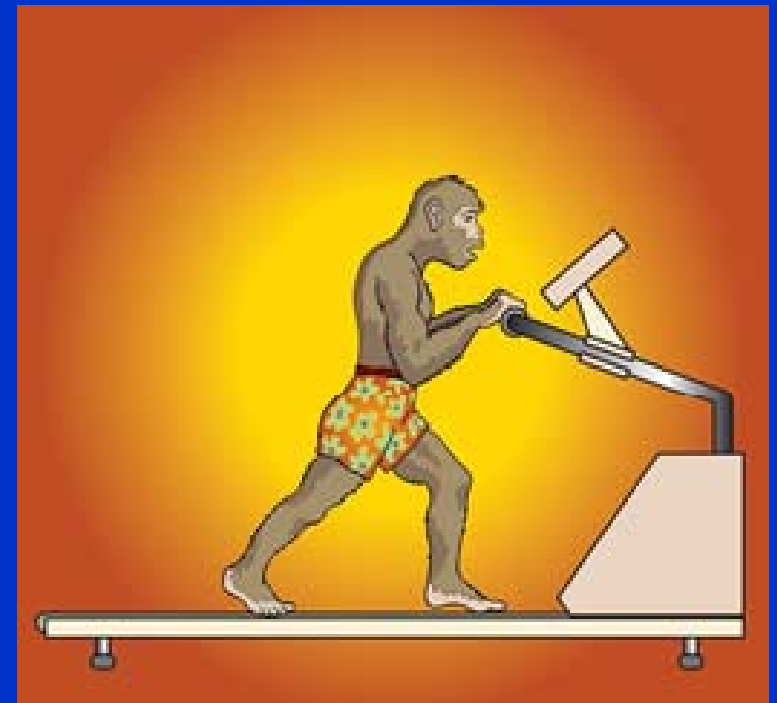
Rest Is The Key

- How you structure the rest, more than the work, will determine the training effect of the workout.



Goal Pace - Date Pace

- $\dot{V}O_2 \text{ max}$ = strict date pace
- Anaerobic glycolytic is run at goal pace and faster



Glycolytic Workouts

- Choose between Speed Endurance, Special Endurance 1, or Special Endurance 2.
- Decide the extent
- Decide the intensity
- Decide the reps and sets
- Decide the total volume

Glycolytic Workloads

Speed Endurance	60 meters to 150 meters @ 97% max effort	2 sets of 5 reps of 110 meters.
Special Endurance 1	150 meters to 300 meters @ 95% max effort	2 sets of 3 reps of 300 meters
Special Endurance 2	300 meters to 600 meters @ 92% max effort	1 set of 4 reps of 500 meters

Glycolytic Workout Example #1

- 8 * 400's. (Special Endurance 2)
- 62 seconds each (Intensity)
- 3 min rest between reps/ 5 min between sets
- Total volume is 3200 meters

Glycolytic Workout Example #2

- 8 * 200's (Special Endurance 1)
- 28 seconds each (Intensity)
- 6 min rest between, 1 set
- Total volume is 1600 meters

Glycolytic Capacity Work

- Repetition running is the type of work
- Parameters of the load is near max with long recovery
- Rest as a vital component
- Watch out for “OVERDOING” the effort



Peaking

- Tied intimately to capacity work
- Volume decreases
- Intensity becomes a bigger piece
- Biochemically based
- How long can it last
- The base establishes the peak

Cornerstone Speed Workouts

- 8 * 60 sec runs on grass
- 8 * 400 with 3 min rest
- 6 * 500 with 3 min rest
- 8 * 400 with 45 sec rest
- 6 * 300 meter hill with 3 min rest
- 15 * flying 30 meters with 3 min rest
- 4 * 400 with 13 min rest
- 1 * 600 meters

The End!



Athletesacceleration.com/trackandfieldendurance.html

*The Complete Guide to Track
and Field Conditioning for
Endurance Events*

By Scott Christensen

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