



ENDURANCE TRAINING GUIDELINES FOR YOUNG ATHLETES U13 +

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COACHING

- Coaching – Art / Science ?
- Science – Physiological Terminology
- There is an abundance of terminology – aim was to produce up-to-date information for coaches regarding energy training terminology and its basic application for endurance running.
- All athletes are individuals.

Percentages of 3 Main Energy Systems for each Endurance Event

Distance (m)	ATP-PC Max HR	Anaerobic-Lactate 90% - max HR	Aerobic 50-85% Max HR
800m	10%	30%	60%
1500m	8%	20%	72%
3000m	5%	15%	80%
5000m	4%	10%	86%

Not percentages for training, but showing necessity for aerobic training

Using these energy systems, training can be broadly split into 6 zones based around key physiological landmarks:-
 Lactate Threshold (LT) Lactate Turnpoint (LTP) and Maximal Oxygen Uptake (VO₂ Max)



Lactate Threshold

- First increase in blood lactate above baseline levels
- Speed at lactate threshold is a strong predictor of the average speed that can be sustained in the marathon.

Lactate Turnpoint

- The Lactate Turnpoint is the running speed at which there is a distinct “sudden and substantial” breakpoint in blood lactate.

VO₂ MAX

- An important measure of performance capability in middle/long distance running.
- The highest rate at which ATP can be re-synthesised aerobically.
- VO₂ Max tends to be highest in athletes who specialise in events that are run close to VO₂ Max (i.e. 3000m and 5000m)

Example Training Zone Distribution

Zone	1	2	3	4	5	6
Description	Recovery	Easy	Steady	Tempo/Extensive Aerobic Intervals	Intensive Aerobic Intervals	Speed Endurance (Anaerobic Speed)
Perceived Exertion	Very easy	Easy	Comfortable	Uncomfortable	Very stressful	Maximal
Breathing reference	Very easy to talk	Easy to talk	Ok to talk	Hard to talk	Cannot talk	NA
Typical %HRmax	<60%	<80%	81-89%	90-95%	96%-Max	NA
Typical [La] range (mM)		<2.0	1.0-4.0	4.0-9.0	9.0-12.0	12.0-22.0

Coaching Young Athletes

Coaches working with younger athletes should ensure that they plan sessions targeting all the different training zones as training at different levels of intensity is important and coaches must, particularly, appreciate the dangers of excess in both volume and intensity – whilst realising just how much can be possible with appropriate constraints and good sense.

Factors to Take into Account

- Athlete's age
- Athlete's maturity
- Number of years training
- Different training phases of the year
- Competition distances targeted
- Number of training sessions per week
- Mileage/kilometre weekly volume
- Athlete's strengths and weaknesses
- Event demands

ZONE 1: RECOVERY ZONE

Recovery runs are used after races, or after a hard training session.

Example sessions:

Zone 1: Recovery

	NOVICE	IMPROVER	EXPERIENCED
ZONE 1 (RECOVERY)	20 – 30 min continuous	20 – 30 min continuous	20 – 30 min continuous

ZONE 2: EASY

Easy running is used in long runs, supplementary runs, warm-ups, cool-downs and active recoveries between higher intensity intervals. The primary benefit of easy running is that it enables you to run more distance without greatly increasing stress on your body.

Easy running also develops the capillary network, stimulation of fatty acids and aerobic enzymes.

Running faster on easy days may result in not performing as well on harder days. Simply resting between harder runs on the other hand will not allow accumulation of mileage, possibly negating further fitness benefits.

Example sessions:

Zone 2: Easy

	NOVICE	IMPROVER	EXPERIENCED
ZONE 2 (EASY)	20 – 30 min continuous	30 – 60 min continuous	30 – 120 min continuous

ZONE 3: STEADY

Steady running is executed above LT but below LTP (e.g. 81-89 % of max heart rate). At the lower end of the zone (81-85% of max heart rate), this involves medium to long workouts and at the higher end of the zone (86-89% of max heart rate), this involves medium to short workouts.

All workouts regardless of duration are generally run at a fairly constant pace. The athletes should get tired as a function of volume not the intensity of the session. Training progressions are achieved by increasing the length of time at this load and/or the average speed the runs are completed at.

Example sessions:

Zone 3: Steady

	NOVICE	IMPROVER	EXPERIENCED
ZONE 3 (STEADY)	20 – 30 min continuous	30 – 45 min continuous	30 – 60 min continuous

ZONE 4: a) TEMPO

Tempo pace is traditionally defined as the running pace at or slightly above which the blood lactate level begins to spike – that is, the LTP.

Tempo runs are traditionally run just above LTP at the lower end of the zone and are generally constant pace efforts for a relatively prolonged period of time. They typically take the form of a sustained effort with the primary purpose to increase the pace one can sustain for a prolonged period of time and increase the time one can sustain a relatively fast pace. Many coaches and runners do longer tempo runs at slower than true tempo pace. Prolonged running at this relatively hard intensity builds a good sense of maintaining a strong pace for an extended period of time. Additionally, some runners gradually build up the intensity of a longer tempo run until actually running at tempo pace for the target duration. All these practices can yield positive results.

Example sessions:

Zone 4: Tempo

	NOVICE	IMPROVER	EXPERIENCED
ZONE 4 (TEMPO)	10 min run	20 min run	30 min run

ZONE 4: b) EXTENSIVE AEROBIC INTERVALS

(sometimes referred to as cruise intervals and/or threshold runs)

These are traditionally run at the upper end of the zone and can span a wide number of sets and reps. They should have built into them sufficient rest or slow work to allow complete recovery between reps or sets. This design format ensures that there is no accumulated fatigue between sets or reps allowing maintenance of quality rather than a reduction in performance caused by fatigue. This can generally be achieved by employing a general rule of thumb of 5:1 work:rest ratio – that is for every 5 minutes of running, recovery should be around 1 minute (in practice the coach may alter this depending on time of year, training state of the athlete etc). The aim of these sessions is to get the body used to working intermittently above LTP and practice recovering after each effort. Gradually this type of training stimulates improved economy and increased fatigue resistance allowing the body to gradually increase the work it can do without accumulating progressive amounts of lactate.

Example sessions:

	NOVICE	IMPROVER	EXPERIENCED
ZONE 4 b) (EXTENSIVE AEROBIC INTERVALS)	2 x 1600m (recovery less than rep)	3 x 1600m (recovery less than rep)	4 x 1600m (recovery less than rep)
	2-3 x 1000m (recovery less than rep)	4-5 x 1000m (recovery less than rep)	5-6 x 1000m (recovery less than rep)

ZONE 5: INTENSIVE AEROBIC INTERVALS

The reps and sets of these types of sessions are designed in such a way that during each interval and during the workout there will be an accumulation of blood [La] often between 5-12 mM by the end of the session. The main goal however is to maximally challenge the aerobic as opposed to the anaerobic system. To do this, the distance or time governing each rep usually needs to be a minimum of 3 minutes (as it takes around 2 minutes to reach the point where the body is operating at VO_2 max – the purpose of the workout). If performing shorter duration reps (e.g. 1 minute reps) then recovery must be reduced so that one is not fully recovered before the start of the next rep. Using this practice, after several intervals one may reach VO_2 max in a much shorter duration thereby accumulating more time at VO_2 max.

Therefore, when taking into consideration the amount of recovery taken between repeated runs the athlete should aim for equal to (if taking active recovery), or a little less (if taking complete rest – generally half the rep duration) than the rep duration. The athlete should be able to perform each rep at the same velocity and with the same technique throughout the session.

Example sessions:

	NOVICE	IMPROVER	EXPERIENCED
ZONE 5 (INTENSIVE AEROBIC REPS)	6 x 1 minute Rec: 1min	5 x 3mts Rec: 2 min	6 x 5mts Rec: 2 min
	10 x 200m (30 sec – 2 min rec)	8 x 400m (30 sec – 2 min rec)	10 x 400m (30 sec – 2 min rec)
		15 –20 x 200m (30 sec – min rec)	20-24 x 200m (30 sec – 2 min rec)

Zone 6: Speed and Speed Endurance (Anaerobic Speed)

Speed endurance (Anaerobic Speed) pace training can span a wide number of reps and sets and it corresponds to roughly 1500m race pace at the lower end up to a full sprint at the top end. The benefits of Speed training are associated more with mechanics and anaerobic metabolism than with aerobic factors. As a result speed paced training usually consists of relatively short workouts with enough recovery time to allow each subsequent run to be just as efficient as the first run of the session. Therefore a key difference between speed endurance (Anaerobic Speed) paced running and aerobic interval paced running, other than the pace of the run, is that more recovery is generally required in order to maintain speed and mechanics for the duration of the session. Determining the exact recovery time between reps and sets can be fairly subjective and may come down to coach experience and athlete status but in simple terms, recovery should be as long as it takes until the athlete is ready to perform the next workout as well as the previous one. If unsure, a heart rate monitor can be used between reps to determine how long recoveries should be by simply waiting until heart rate drops in to at least zone 2.

Example sessions:

	NOVICE	IMPROVER	EXPERIENCED
ZONE 6 (SPEED ENDURANCE or ANAEROBIC SPEED)			
For 800m type –	4 x 200m Rec: 5 minutes	3 x 500 mts. Rec: 6 minutes	2 x 600 metres Rec: 12 minutes
For 10 Km type -	Not applicable	6 x 800m Rec: 3 mins	1600m/1200m/800m/400m Rec: 5 mins/4mins/3 mins

ANAEROBIC TRAINING

- During adolescence sessions which for mature athletes would be deemed as speed endurance sessions (Anaerobic), because of the young athletes metabolism, will be more likely to be aerobic training. The training structure will need to be adjusted to take this into consideration.

ALACTIC TRAINING

- It is recommended that pure speed (Alactic) training should also be included in younger athletes training programmes. These sessions are used to develop both the neurological system and fast twitch fibres and will be over distances of not more than 8 seconds duration e.g. 4 x 50m with complete recovery between repetitions (5 mins +)

CONCLUSION

- Gradual and evident progression during season and career
- Balance of training intensities
- Planning and periodisation or training organisation
- Ensuring adequacy of recovery and recuperation
- Short term and longer-term means of evaluation
- Two-way communication
- Progressive athlete education
- Individualisation

WEEKLY WINTER TOTAL MAX KM GUIDELINES FOR MALE AND FEMALE ATHLETES
- HONORE HOEDT
DUTCH HEAD COACH FOR ENDURANCE
FROM BMC CONFERENCE – MARCH 2010

Age	400m-800m	1500m-3000m	Steep/5Km	5-10 Km	½ mar/mar
25	60 – 80 Km	120 – 180 Km	140 – 200 Km	160 - 240 Km	200 – 280 Km
24	55 – 75 Km	130 – 170 Km	130 – 200 Km	150 – 220 Km	180 – 260 Km
23	50 – 70 Km	120 – 160 Km	120 – 200 Km	140 – 200 Km	160 – 240 Km
22	45 – 65 Km	110 – 150 Km	110 – 180 Km	130 – 180 Km	140 – 220 Km
21	40 – 60 Km	100 – 140 Km	100 – 160 Km	120 – 160 Km	120 – 200 Km
20	35 – 50 Km	90 – 130 Km	90 – 140 Km	100 – 140 Km	100 – 180 Km
19	30 – 45 Km	80 – 120 Km	80 – 130 Km	90 – 130 Km	90 – 160 Km
18	25 – 40 Km	75 – 110 Km	75 – 120 Km	80 – 120 Km	80 – 140 Km
17	20 – 35 Km	70 – 100 Km	70 – 110 Km	70 – 110 Km	70 – 120 Km
16	20 – 30 Km	60 – 90 Km	60 – 100 Km	60 – 100 Km	60 – 100 Km
15	15 – 25 Km	50 – 80 Km	50 – 80 Km	50 – 80 Km	50 – 80 Km
14	15 – 20 Km	45 – 60 Km	45 – 60 Km	45 – 60 Km	45 – 60 Km
13	10 – 15 Km	40 Km	40 Km	40 Km	40 Km
12	10 Km	35 Km	35 Km	35 Km	35 Km

Age	Maximum Winter Mileage		Maximum No of Quality Sessions/wk	
	1500	800	Winter	Summer
13	10-15	10-15	2	2
14	15-25	15-25	2	2
15	20-30	20-30	2	2-3
16	30-45	25-40	3	3
17	40-50	35-45	3	3-4
18	45-60	40-55	3	4
19	55-70	45-60	3	4
20	60-75	50-65	3	4
21	65-80	50-70	3	4

- Note: 1. The above recommendations refer to a non racing week and are an approx guide. They may not be advisable for every athlete – please allow coach to set mileage.
2. In the above no distinctions are drawn between male and female 800/1500 athletes.

From: Norman Poole