Building Endurance

By Susan Ellis

Speed skating is a sport with many different distances, from sprint races, to 10K races, to marathon skating. Each of the distances draws on certain types of fuel to maximize performance. A 100m race is so short it does not require great aerobic endurance (oxygen) but draws on the fuel stored in the muscles (ATP-CP) to provide energy. A 500m race also draws on this energy system with a slight contribution from the Aerobic system. 1000m and 1500m races use a combination of the ATP-CP and the Aerobic system. But even 500m skaters need good base endurance to allow them to do the volume of training necessary to fight through the lactate burn and to recover better between training sessions.

There are different kinds of endurance that are required in skating, and each kind requires a different kind of training approach. All skaters, whether sprinters or distance skaters need to incorporate some of each into their yearly plan. But your specialty, or the target area of improvement for the year, will help to determine what type of endurance you will focus on. There are different fuels our body uses for different lengths and intensities of exercise and you must train specifically to improve the fuel efficiency of each. In long track this is easier to do if you are a specialist, but in short track or all round long track you need to be good at all the distances to accumulate your points.

Non-Specific Endurance

Probably the easiest system to train, and the one where you'll see the greatest gains is the Aerobic Capacity or aerobic endurance. This is your longer endurance type training involving 20' to 2 hrs of running, cycling, or inlining. The longer the skating distance, the more important this system becomes as your body tries to get oxygen to the muscles to make them work.

Aerobic endurance training helps to increase the network of capillaries in the muscles, allowing more blood to get to the muscles during exercise. Blood flow is necessary to get new oxygen into the muscles and to carry waste products out. The more efficient this system is, the longer you can operate and the faster you can go. The problem with the aerobic capacity system is that it's like a low test gasoline. It doesn't have much power to take you beyond a certain speed for very long. But if you don't have this base of endurance you won't go anywhere for long anyway.

Specific Muscle Endurance

This is the endurance which is specific to skating. It's used in every race from the 500m to the 10,000m. You can be a great marathon runner, but may not be able to skate 500m at high speed in a good skating position without Specific Muscle Endurance. So how do you get it?

In days of old, when Knights were bold, and Marchese and Apex were not invented, it was thought that the more laps you could skate, the better your endurance was. Yep, and the knights were right! But that doesn't mean they could sprint an entire 500m or 1000m at super high speed either.

To get what you want, you need to train specifically for what you want.

If all you want to do is marathon skating then go ahead and do long, long laps. But if you want to do it faster, then you need to incorporate faster interval training into your plan to give you that speed. If you want to improve your 500m then you need to do lots of short, fast stuff, but you still need to do some longer stuff to help build and maintain your aerobic base so you are able to do the volume of training necessary to fight through the lactates.

The chart below lists the 6 basic energy systems and the type of training which can be done to specifically improve each system.

SYSTEM	ANAEROBIC ALACTIC POWER	ANAEROBIC ALACTIC CAPACITY	ANAEROBIC LACTIC POWER	ANAEROBIC LACTIC CAPACITY	AEROBIC POWER	AEROBIC CAPACITY
WORK TIME	0-5"	7-15"	15"-45"	45"-2'	10"-5'	>15'-2 hrs
INTENSITY	(100%)	(100%)	(96-100%)	(85-95%)	(75-95%)	(60-80%)
REP REST	1 : 10-20	1 : 5-8	1 : 8-10	1 : 5-6	2:1 to 1:5	
SET REST	5-10'	5-10'	10-15'	10-15'	5-15'	
REST TYPE	total	total	active followed by total	active followed by total	active followed by total	
SET VOLUME		60" max			5-20 reps	
TOTAL VOLUME	< 3'	3-8'	< 12'	< 12'	30' max	
NOTES	Normally part of or immediately following warm up. Used in combination with other programs.	Normally part of or immediately following warm up. Used in combination with other programs.	Important to respect rest / work ratios to allow time for restoration of energy supply. If rest is inadequate work cannot be accomplished at desired speed.	Important to respect rest / work ratios to allow time for restoration of energy supply. If rest is inadequate work cannot be accomplished at desired speed.	The longer the work period the lower the % of intensity is normally. Also dependent on # of reps. Too high an intensity may result in too high an accumulation of lactates.	Off ice programs only. Work periods are too long to be done on ice as basic position is inherent to lactate accumulation.

Remember, each race draws primarily from one of these energy systems but there is always overlap so you can't just train all the time in one system. Your goal is to decide what exactly needs to improve. If you have great speed, but putter out at the 400m mark of the 500 then you need to work on your Anaerobic Lactic Capacity. If you have great endurance in your 1500 but need to improve your speed then you may need to work on your Lactic Power as well as your Lactic Capacity since you already have your Aerobic Power base.

The primary energy source for each of the races are:

ANAEROBIC ALACTIC POWER	ANAEROBIC ALACTIC CAPACITY	ANAEROBIC LACTIC POWER	ANAEROBIC LACTIC CAPACITY	AEROBIC POWER	AEROBIC CAPACITY
½ L Starts	100m	500m	1000m 1500m	3000m 5000m	10,000m marathon

To do a 1000m race at high speed you will be using the anaerobic lactic capacity system, but with a high contribution from lactate power and a smaller contribution from aerobic power.

For the 10,000m your primary energy source is aerobic capacity but there is an almost equal contribution from aerobic power as this is what gives you the speed to sustain your intensity.

So what do you train first: Power or Capacity?

This is a bit of a debate and I think it depends on what your initial needs are. If you need speed first then you train towards the shorter interval end of the system first. If you need more endurance in that system then you train the longer interval end first.

The chart below gives you an idea of some different short track programs for each energy system. The programs can be done either on ice or off ice in the form of running, cycling, inline, imitations, etc. (The exception here is Aerobic Capacity training which is always done off ice).

Abbreviations:
AAC – Anaerobic Alactic Capacity
AAP – Anaerobic Alactic Power
LC – Lactic Capacity
LP – Lactic Power
AP – Aerobic Power
AC – Aerobic Capacity

ACTIVITIES FOR TRAINING SYSTEMS		
Activity	**% of perceived intensity**	**System**
5 - 10 x 5" r1.30-2'	100	AAP
3 x 10 x 3" r10" R6'	100	AAP
reactions 2(10 x 3" r12") R6'	100	AAP
5 x 1/2 lap starts r1'	100	AAP
3 x 5 x 5" r30" R5'	100	AAC
5 x 4 x 10" r50" R8'	100	AAC
3-5 x 4 x 15" r1.30 R8'	100	AAC
4 x 1L starts r2'	100	AAC
Weights/strength		LP
jumps	95	LP
2 x 8 x 100m r2' R8'	95	LP
2 x 10 x 15" r2.30 R8'	96	LP
5 x 40" r10'	98	LP
6 x 30" r8'	98	LP
6 x 15" hills r2.30"	100	LP
2 - 4 x 4 x 15" r4' R10'	100	LP
3(1Lr1.5', 2Lr3', 3Lr4' 2Lr3' 1L) R6'	96	LP
2(6 x 30" r5') R8'	96	LP
5 x 2' r10'	85	LC
2 x 2 x 2' r7' R10' progressive	90	LC
6 x 1' r6'	90	LC
5 x 1.30" r7'	90	LC
4 x 400m r8'	95	LC
6 x 1' r5' progressive	95	LC
3 x 3 x 30" r2.30 R8-10'	95	LC
2 x (400m r5', 700m r8', 400m) R10'	95	LC
2 x (300m r4', 600m r7', 300m) R10'	95	LC
3 x (200m r2.30", 400m r4', 200m) R8'	96	LC
2(3 x 9L r6') R8'	85	LC
relay groups of 4, 3(4 x 3L) R5'	85	LC
relay groups of 4, 3(3 x 3 L) R8'	90	LC
6 x 6L r6'	90	LC
3 x 9L r7'	95	LC
Relay groups of 5, 3(4 x1L) R8'	95	LC
666 time trial	95	LC

6 x 3' r3'	80	AP
4 x 5' r3-5'	80	AP
2 x 3 x 2' r1.30 R6'	80	AP
2 x 2 x 2.30" r2' R6'	80	AP
8 x 2' r2'	82	AP
2 x 3 x 2' r2' R8'	83	AP
2 x 6 x 1' r1' R6'	85	AP
2 x 4 x 50" r1.45 R6-7'	85	AP
4 x 3' r5'	85	AP
3 x 6' r12'	85	AP
3 x 5' r15'	86	AP
2 x 4 x 1' r1' R5'	86	AP
2 x 6 x 1' r2' R6'	88	AP
3 x 3.30" r6'	88	AP
3 x 6 x 30" r30" R8'	90	AP
3 x 5 x 40" r1.30 R6'	90	AP
4 -6 x 3' r15'	92	AP
4 x 6 x 15" r15" R8'	95	AP
1500m time trials	100	APLC
3000m time trials	100	AP
3 x 3 x 30" r1' R5'	95	AP
2 x 7 x 15" r45" R6-8'	95	AP
2(3 x 7L r3') r6'	80	AP
2(3 x 5L r1.30") R5'	80	AP
2(7L, 9L, 13L, 9L, 7L r=w) R8'	82	AP
3(6 x 30" r1') R6'	90	AP
4 x 13.5 L r5'	90	AP
3 x 27L r8'	95	AP