

USING ENERGY SYSTEMS TO CREATE TRAINING PROGRAMS

Using Energy Systems to create training programs works best for running events lasting longer than 5 seconds. For any event with a duration between 0 and 5 seconds, the Phosphagen energy system (anaerobic alactic) is the only one used and training is very simple...only the attributes needed to execute the event need to be trained. By attributes, I mean Skill, Strength, Power and Flexibility. Some aerobic training is needed for help in recovery from training sessions and competitions. All the field events come under this category.

For all running events, however, designing training programs can be greatly helped using energy system knowledge. It is easiest shown using a couple of examples.

Let's first look at the **200m sprint** event.

Consulting the [Energy System Chart](#) in "Training the Energy Systems" we see that 26% of training should be the phosphagen system, 52% should be the glycolitic (anaerobic lactic) system and 22% should be the aerobic system. Slightly more than half of the running training should be for the glycolitic energy system. During the Pre competitive and Competitive phases the **power** section of glycolitic training would be used.

200 Metres			
%	Phosphagen	Glycolitic	Aerobic
100			
90			
80			
70			
60			
50		52 %	
40			
30	26 %		
20			22 %
10			

Looking in "Training the Energy Systems" we see that to train for Glycolitic Power, the [Training Chart](#) shows that running training should be done at 85% to 95% speed with each workout between 800m and 1600m total distance run and with a 1:3 to 1:4 work:rest ratio. As an example, an athlete with a best of 24 seconds over 200m would have a time of 25.4 sec at 95% speed and a time of 28.2 at 85% pace.

TRAINING CHART

Energy System	Quality	Percentage Maximum Speed	Work:Rest Interval	100m time for a 12.0 sec PB	400m time for a 56.0 sec PB	1600m time for a 56.0 sec 400m PB	Total Distance Run
Phosphagen (anaerobic alactic)	Power	95 to 105	1:12 plus 3 minutes plus	11.4 to 12.6			200m to 400m
	Capacity	90 to 100	1:6 to 1:12 3 minutes plus	12.0 to 13.3			400m to 800m
Glycolitic (anaerobic lactic)	Power	85 to 94	1:3 to 1:4 active rest	12.6 to 14.1	59.0 to 66.0		800m to 1600m
	Capacity	75 to 84	1:2 to 1:3 active rest	14.1 to 16.0	66.0 to 75.0		1600m to 3000m
Aerobic (aerobic glycolysis, lipolysis)	Power	65 to 74	1:1 to 1:2 active rest	16.0 to 18.5	75.0 to 86.0	5:00 to 6:30	3000m to 5000m
	Capacity	64 or less	1:1 minus active rest	18.5 or slower	86.0 or slower	6:30 or slower	5000m plus

Looking at the faster end of the speed (95% speed workout), 8x100m would fit for the overall 800m distance and the pace would be 25.4 times 0.5 = 14.7 sec for each 100m. The rest interval would be 1:4 indicating 1 minute walking between each 100m sprint. At the slower end of the speed (85% speed

workout), 8x200m would fit for the overall 1600m distance and the speed would be 28.2 sec for each 200m. The rest interval would be 1:3 indicating 1.5 minutes walking between each 200m. The **rest interval** in Glycolitic or Aerobic training **is always active** (either walking or jogging), usually walking for Glycolitic and jogging for Aerobic.

It's easier to look at the workouts using a table. Here is a table of workouts for the Glycolitic Energy system for the 200m event that can be used for an athlete with a 24 second PB.

ENERGY SYSTEM	RUNNING SPEED	TOTAL TRAINING DISTANCE	WORKOUT Reps X Distance	REST INTERVAL	TIME FOR 24 SECOND PB 200m	WORKOUT TYPE*
Glycolitic power	95%	800m	8x100m	1:4 50 sec	12.7 sec	Speed Endurance 1
	90%	1200m	8x150m	1:3 60 sec	20.0 sec	Speed Endurance 1
	90%	1200m	12x100m	1:3 40 sec	13.3 sec	Speed Endurance 1
	85%	1500m	10x150m	1:3 45 sec	23.5 sec	Speed Endurance 1
Glycolitic capacity	85%	1600m	8x200m	1:3 1.5 min	28.2 sec	Speed Endurance 1
	80%	2400m	2x(6x200m)	1:2.5 1.5 min	30.0 sec	Speed Endurance 1
	80%	2400m	4x(250/200/150m)	1:2.5 1.5-1m	37.5/30/22.5 s	Speed Endurance 1
	75%	3000m	2x(6x250m)	1:2 1.5 min	40.0 sec	Speed Endurance 1

These would work for the two glycolitic workouts each week of the four running workouts. There should also be a phosphagenic workout as well as an aerobic workout each week to fulfill the energy system training requirements. Usually, the energy system power workouts are done during the competitive phases and the capacity workouts are done during the preparation phases of the yearly training plan.

ENERGY SYSTEM	RUNNING SPEED	TOTAL TRAINING DISTANCE	WORKOUT Reps X Distance	REST INTERVAL	TIME FOR 24 SECOND PB 200m	WORKOUT TYPE*
Phosphagen Power	105%	200m	4x50m downhill	1:12+ 3 min	5.7 sec	Speed
	95%	400m	5x80m	1:12+ 3 min	10.0 sec	Speed Endurance 1
Phosphagen Capacity	100%	400m	8x50m	1:12+ 3 min	6.0 sec	Speed
	90%	800m	8x100m	1:12+ 3 min	13.3 sec	Speed Endurance 1
Aerobic	75%	3000m	10x300m	1:2 1.5 min	48.0 sec	Speed Endurance 2
	65%	3200m	2x1600m	1:1 10 min	10 min	Endurance

Now, let's look at the **800m event**. Consulting the energy system chart in "Training the Energy Systems" we see that only 6% of training should be the phosphagen system, 30% should be the glycolitic (anaerobic lactic) system and **64%** should be the **aerobic system**. Two thirds of the running training should be for the Aerobic energy system. Of **six running workouts** during a training week, four would be aerobic, one glycolitic and one workout a combination of glycolitic and phosphagenic.

800 Metres			
%	Phosphagen	Glycolitic	Aerobic
100			
90			
80			
70			64 %
60			
50			
40			
30		30 %	
20			
10	6 %		

The glycolytic workouts could be: **Workout 1** with 2000m of running at 80% speed and **Workout 2** of 1000m of running at 90% speed preceded by 400m of running at 100% speed for the phosphagen system. The other 4 running workouts could cover the full range of aerobic workouts from up to 10,000m at 55% (jogging) pace down to 3000m at 74% pace. For a 2:00 minute 800m runner with a 24 sec 200m PB, one such **glycolitic power workout** could be 6x300m (total 1800m) with a 2 minute interval at 45 second speed (race pace)....[1800m - 100% race pace - 1:3 work:rest ratio].

An example of a longer aerobic workout would be 2x3000m with a 12 minute rest interval. For an 800m runner with a best of **2:00 min 800m** and **52.0 sec 400m**, a **shorter aerobic workout** could be quite varied from **Workout 1** - 16x200m (3200m) at 35 sec (75% 400m speed) with a 60 sec rest between (1:2 work:rest ratio) to **Workout 2** - 12x400m (4800m) at 80 sec (65% 400m speed) with a 1.5 minute rest between (1:1 work:rest ratio) and numerous others at variable distances run from 200m to 800m.

To be clear about the Energy Systems listed in each table...these are the **dominant energy systems**. During any run from 10 seconds to 10 minutes all the energy systems are being used but in different proportions. In workouts labelled **Glycolisis**, there are also some phosphagens being used and also some lipolisis and aerobic glycolisis taking place, but the dominant energy system is anaerobic glycolisis. This is most obvious at the junction of the dominant energy systems at 75% running speed between Glycolitic Capacity and Aerobic Power. Clearly, at 75% speed, it is a mix of the two energy systems. The differentiation on the charts is for convenience.

Looking at the Aerobic workouts as a chart, here is a selection of workouts for a **56 sec 400m PB**.

ENERGY SYSTEM	RUNNING SPEED	TOTAL TRAINING DISTANCE	WORKOUT Reps X Dist.	REST INTERVAL	TIME FOR 56 SECOND PB 400m	WORKOUT TYPE*
Aerobic Power	74%	3000m	10x300m	1:2 2 min jog	56.8 sec	Speed Endurance 2
	70%	4000m	10x400m	1:1 1.5 min jog	1min 20 sec	Speed Endurance 2
	70%	4000m	8x500m	1:1 1.5 min jog	1min 40sec	Speed Endurance 2
	65%	4800m	8x600m	1:1 2 min jog	2min 11sec	Speed Endurance 2
Aerobic capacity	65%	5000m	5x1000m	1:1 2 min jog	3min 40sec	Endurance
	60%	6000m	2x3000m	2:1 6 min jog	12 min	Endurance
	55%	8000m	8000m run	none	34 min	Endurance

There is a huge variety that can be used planning workouts especially when mixing track workouts and runs such as 2 by 1200m on the track followed by 2400m on trails. Also, the use of speed play workouts on trails can be used where the runner is using steady pace for most of the run (say 5000m) but puts in 30 to 60 seconds bursts of intermittent faster portions. As a coach, I prefer the trail runs for Aerobic workouts as track work on composition tracks is very hard on the legs of the runners, particularly the calf muscles. Longer distances should be run as much as possible on softer surfaces such as chip trails, clay and sand based trails and grass fields. My personal preference is to keep track work only for a maximum 4000m total distance run during the workout. I would also say that no aerobic capacity workout should be run on the track. Runners in the past have done long workouts on tracks but those were cinder and clay based.

For Speed Endurance workouts, once the pace that the athlete can do the workouts at has been established, the following pace table can give the specific speed for each distance in the interval workouts:

Distance	Time	Time	Time	Time	Time								
400m speed	86	83	80	77	74	71	68	65	62	59	56	53	50
700m	2:30	2:25	2:20	2:15	2:10								
600m	2:09	2:05	2:00	1:56	1:51	1:47	1:42	1:38	1:33	1:29	1:24	1:19	
500m	1:47	1:44	1:40	1:36	1:33	1:29	1:25	1:21	1:18	1:14	1:10	1:06	1:03
400m	1:26	1:23	1:20	1:17	1:14	1:11	1:08	1:05	1:02	59	56	53	50
350m		1:14	1:11	1:08	1:06	1:03	1:01	58.2	55.6	53.0	50.3	47.7	45.1
300m		1:02	1:00	57.8	55.5	53.2	51	48.8	46.5	44.2	42	39.8	37.5
250m			51.0	49.1	47.2	45.3	43.4	41.6	39.7	37.8	36.0	33.9	32.2
200m			40	38.5	37	35.5	34	32.5	31	29.5	28	26.5	25
150m				29.5	28.4	27.2	26.1	25.0	23.9	22.7	21.6	20.5	19.3
100m				19.3	18.5	17.7	17	16.3	15.5	14.8	14	13.3	12.5

Looking at the table, for a **10x300m** workout (3000m), the speed would be 51 sec with a 1.5 min interval at 1:2. To run 400's at the same level, the workout would be **8x400m** (3200m) at 71 sec with a 2 min interval. Similarly, a **5x600m** (3000m) workout would use a 1 min 56 sec speed with a 2.5 min interval - all in the purple speed zone. The same effort would have to be applied to each workout in the 71sec 400m speed zone.

Obviously, to get improvement, the speed objectives from microcycle to microcycle would have to be faster. Also, I have found that to best adapt the runners to the racing dates in the competitive season (usually Saturdays) that the Saturday Speed Endurance workouts be at race pace as much as possible during the Specific Preparation and Pre Competitive Training Phases. These workouts are **Special Endurance** workouts and are done at 95 to 100% race pace with a total distance run from 1.25 to 2 times the actual race distance. As the runners body adapts to the cyclical microcycle patterns, the runner will be ready each Saturday for race pace work and will stay that way throughout the season from Specific Preparation to Competition Phases.

An example of a Special Endurance workout would be 600m/400m in 1:30 and 60.0 sec respectively at 100% pace but with a 10 minute interval. The interval would be a combination of walking and jogging.

Actually, the Saturday workout fits very well into the combined Phosphagenic and Glycolytic workout previously discussed as one of the six running workouts done in a weekly microcycle. Since very little recovery time is needed from the Phosphagenic workout (7x60m with 3 minutes complete rest between) only 10-15 minutes rest would be needed before commencing the Special Endurance section of the workout.

For an athlete in school or working and only able to train once per day, the weekly microcycle during the Pre-competitive Phase could look like this:

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Type	Aerobic Speed Endurance 2	Glycolitic Speed Endurance 1	Aerobic Endurance	Aerobic Speed Endurance 2	Rest	Phosphagen and Glycolitic - Speed and Special Endurance	Aerobic Endurance
Workout	5x1000m 2.5 min rest	15x200m 1 min rest	2x3000m 10 min rest	8x600m 3.5 min rest	Rest	6x60m 3x400m	8000m run

During the competitive season, when preparing for two or three day competitions, the use of **consecutive Special Endurance workouts** will help prepare the athlete to race his best performances two or even three days in a row. These consecutive Special Endurance workouts two or three days in succession take a heavy physical toll on the athlete and usually require at least two recovery days after. The recovery days would employ much slower speeds (less intensity) but much higher volume than the race pace sessions. A rest day prior to the next set of successive Special Endurance Sessions would be advisable also.

**workout type refers to a classification system*

speed endurance 1 100m to 300m runs

speed endurance 2 350m to 600m runs

endurance 700m and longer runs