

Speed training with Distance Runners

What is speed training?

Short Speed Endurance: 30-70m sprints (6-10 sec) run at 95-100% intensity

Speed Endurance: 70-150m sprints (10-20 sec) run at 95-100% intensity

Special Endurance 1: 150-300m sprints (20-40 sec) run at 90-100% intensity

Special Endurance 2: 300-600m sprints (40 sec-2 min) run at 90-100% intensity

Why run fast? Speed Reserve!

The physiological concept of anaerobic speed reserve (ASR) is a relatively new concept to middle distance running. ASR is defined as the difference between an athlete's absolute maximum velocity and their maximum aerobic speed (v_{VO2max}). (Scott Christensen)

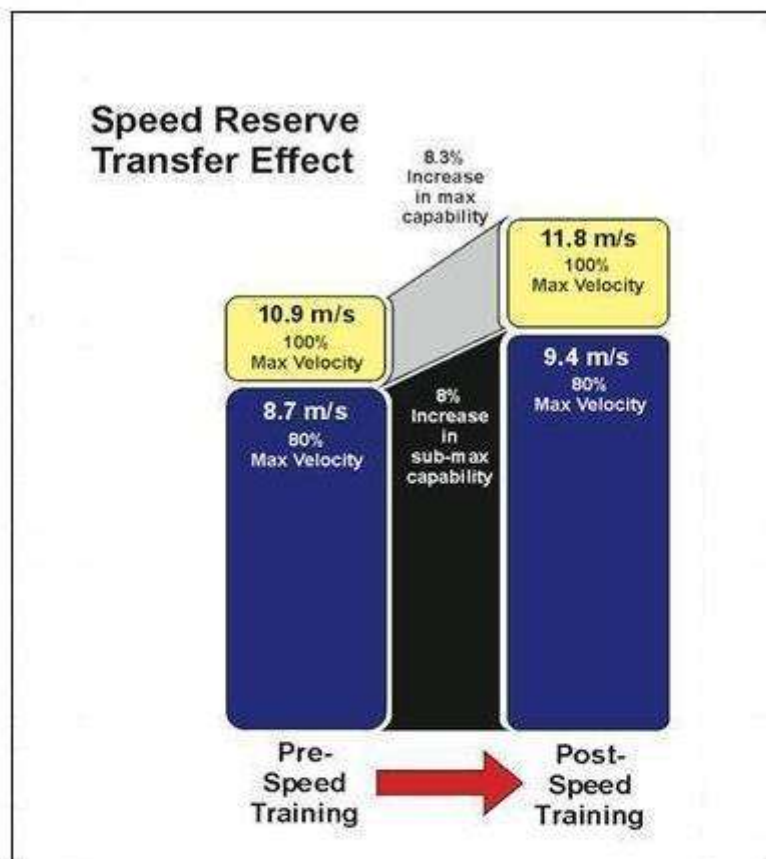


Figure 2. The ASR model predicts that as maximal velocity increases, so will sub-maximal velocity at v_{VO2max} , and at nearly the same percentage improvement (Derek Hansen 2014).

6 Reasons Why All Athletes Should Sprint

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1. **Specificity.** To run fast you need to run fast. Although some of these athletes may never accelerate or sprint 100% maximally in their event or sport, in many cases they are required to run fast. This could be either an explosive first step to position yourself in volleyball, a high jump approach run with 9 m/sec speed or the “long sprint” that is the 800m.
2. **Sprinting develops the athletic muscles.** Sprinting is one of the most powerful activities a person is capable of and it is something that anyone can do. It forces the athlete to recruit and produce contractile velocities in the “athletic muscles” (hip and knee extensors) at speeds and eccentric loads that would be nearly impossible to achieve with any other training activity. This has great potential to improve athleticism across a very broad spectrum of movements and intensities outside of actual sprinting.
3. **Sprinting provides a neuromuscular overload.** Sprinting can provide an overload stimulus on the neuromuscular system that will improve rate coding, contractile velocities, efficiency of recruitment and relaxation of agonist / antagonist muscle groups. It can also help to reset the thresholds on the central nervous system “governors” (that every person is born with as a protective mechanism) that limit performance in high intensity activities.
4. **Increasing speed increases speed reserve.** Because sprint training will make you a faster sprinter it will allow an athlete to run with lower energy expenditure at lower velocities. This means that even if the athlete’s sport or event rarely taps in to maximal speed (like endurance races, soccer, basketball, high jump, etc) the athlete will be able to run the necessary speeds to compete in their even at a lower % of their maximal speed. This in turn permits greater energy conservation and efficiency.
5. **Enhances control of subsequent acyclic activities.** Closely related to the previous point, enhanced maximal speed will allow an athlete to perform acyclic activities at the necessary velocities with greater control. Actions like a hard lateral cut, kicking a ball, or setting up for a takeoff at a given velocity will be easier if they can be performed at a speed that is considerably less than an athlete’s absolute maximum.
6. **Sprinting improves running economy.** This is especially important for any athlete competing in a sport where there is an endurance component to the running that they must do. Sprinting will improve an athlete’s running economy. With improved running economy they can run at the same speed with less Oxygen consumption or run faster with the same Oxygen consumption.

Equivalence tables

Converting 400m PRs to 800m potential

(HS girls)

	<i>Average</i>		<i>Mercier</i>	<i>Purdy</i>	<i>Cameron</i>
400	800m		800m	800m	800m
59.0	2:18.55		2:18.01	2:18.97	2:18.68
59.5	2:19.78		2:19.21	2:20.26	2:19.86
1:00.0	2:21.00		2:20.40	2:21.56	2:21.04
1:00.5	2:22.22		2:21.59	2:22.87	2:22.21
1:01.0	2:23.45		2:22.79	2:24.17	2:23.39
1:01.5	2:24.67		2:23.98	2:25.48	2:24.56
1:02.0	2:25.90		2:25.18	2:26.78	2:25.74
1:02.5	2:27.12		2:26.37	2:28.09	2:26.91
1:03.0	2:28.36		2:27.57	2:29.41	2:28.09
1:03.5	2:29.58		2:28.76	2:30.72	2:29.26
1:04.0	2:30.81		2:29.96	2:32.04	2:30.44
1:04.5	2:32.04		2:31.16	2:33.36	2:31.61
1:05.0	2:33.27		2:32.35	2:34.68	2:32.79
1:05.5	2:34.50		2:33.55	2:36.00	2:33.96
1:06.0	2:35.74		2:34.75	2:37.33	2:35.14
1:06.5	2:36.97		2:35.95	2:38.66	2:36.31
1:07.0	2:38.21		2:37.15	2:39.99	2:37.49
1:07.5	2:39.44		2:38.34	2:41.32	2:38.66
1:08.0	2:40.68		2:39.54	2:42.66	2:39.84
1:08.5	2:41.92		2:40.74	2:44.00	2:41.02
1:09.0	2:43.16		2:41.94	2:45.34	2:42.19
1:09.5	2:44.40		2:43.15	2:46.68	2:43.37
1:10.0	2:45.64		2:44.35	2:48.02	2:44.54

Converting 800m PRs to 1600m potential				Converting 1600m PRs to 3200m potential			
	<i>Average</i>	<i>Mercier</i>	<i>(2x) x 2.25</i>		<i>Average</i>	<i>Mercier</i>	<i>(2x) x 45.0</i>
800m	1600m	1600m	1600m		1600m	3200m	3200m
2:18.00	5:07.59	5:04.69	5:10.50		5:05.00	10:54.87	10:54.74
2:19.00	5:09.86	5:06.97	5:12.75		5:07.50	11:00.16	11:00.33
2:20.00	5:12.08	5:09.16	5:15.00		5:10.00	11:05.46	11:05.91
2:21.00	5:14.35	5:11.45	5:17.25		5:12.50	11:10.77	11:11.54
2:22.00	5:16.62	5:13.74	5:19.50		5:15.00	11:16.07	11:17.14
2:23.00	5:18.84	5:15.92	5:21.75		5:17.50	11:21.38	11:22.77
2:24.00	5:21.11	5:18.21	5:24.00		5:20.00	11:26.69	11:28.38
2:25.00	5:23.32	5:20.40	5:26.25		5:22.50	11:31.99	11:33.99
2:26.00	5:25.59	5:22.68	5:28.50		5:25.00	11:37.32	11:39.63
2:27.00	5:27.86	5:24.97	5:30.75		5:27.50	11:42.63	11:45.25
2:28.00	5:30.08	5:27.16	5:33.00		5:30.00	11:47.95	11:50.90
2:29.00	5:32.35	5:29.45	5:35.25		5:32.50	11:53.26	11:56.53
2:30.00	5:34.57	5:31.63	5:37.50		5:35.00	11:58.58	12:02.17
2:31.00	5:36.84	5:33.92	5:39.75		5:37.50	12:03.91	12:07.83
2:32.00	5:39.10	5:36.21	5:42.00		5:40.00	12:09.23	12:13.46
2:33.00	5:41.32	5:38.40	5:44.25		5:42.50	12:14.57	12:19.13
2:34.00	5:43.59	5:40.68	5:46.50		5:45.00	12:19.89	12:24.78
2:35.00	5:45.86	5:42.97	5:48.75		5:47.50	12:25.22	12:30.44
2:36.00	5:48.08	5:45.16	5:51.00		5:50.00	12:30.56	12:36.12
2:37.00	5:50.35	5:47.45	5:53.25		5:52.50	12:35.89	12:41.78
2:38.00	5:52.62	5:49.73	5:55.50		5:55.00	12:41.23	12:47.46
2:39.00	5:54.84	5:51.92	5:57.75		5:57.50	12:46.57	12:53.13
2:40.00	5:57.10	5:54.21	6:00.00		6:00.00	12:51.91	12:58.83

Incorporating Speed training into practice

95-100% effort sprinting

Primary Drills

1. A march
2. A skip
3. A run

Primary Form cues

1. Running tall
2. Foot plant (e.g. below or ahead of center of gravity)
3. Arm swing
 - Cross-over
 - Arm angles and hands

1. Running fast at the start of practice

Short Speed Endurance	Quantity	Recovery
30-60-90m sprints	1 x 30m, 1 x 60m, 1 x 90m	slow walk back to start
60m sprints	4-8 x 60m	slow walk back to start
Speed Endurance		
Fast 150s	2 x 150m	slow walk back to start + extra
Special Endurance I		
Fast 200s	1-2 x 200m	8-10 minutes
Special Endurance II		
Fast 300s	1-3 x 300m	10-12 minutes
Split 300s (200/100)	2-3 x split 300	1 minute/10-12 minutes
Split 400s (200/200)	1-2 split 400	4 minutes/10-12 minutes
Split 400s (300/100)	1-2 split 400	1 minute/10-12 minutes
Pairs of 300 (95% effort)	2 sets	1 minute/10-12 minutes

2. Running fast at the end of practice

Tag 150m

Tag 200m

Tag 300m

Examples:

2-3 x 4 x 300m @ 1600m race pace + 1 x tag 300

3 x 2 x 300m @ 800m race pace + 1 x tag 150

Other points/concerns

- Warming up
 - Longer warm-ups are important
 - Drills reinforce correct sprint mechanics, so do them right
 - Separating kids into groups may help with distraction and make them more accountable
- Special Endurance II => potentially heavy CNS fatigue
 - Be careful with frequency
 - Races have a very similar effect
- Helping with recovery
 - We typically do our strength routine after these workouts
 - Ice baths are probably not a good idea if it's early-mid season
- Can combine with other training or run as a stand-alone workout
- If you run sub-maximal efforts, then remember that most kids don't get %s
- Time everything, record, and post it (Tony Holler – Record, Rank & Publish)
- Extra things
 - Set up preferred lanes (e.g. #1 ranked kid picks their lane or gets lane #4, etc.)
 - Speed days are great opportunities for “team support”
 - Have fun with it
 - Great teaching moment

“Record, Rank and Publish”

Name	150m bests	Name	300m bests
1. Powell	21.8	1. Powell	45.7
2. Babcock	21.8	2. Domene	46.8
3. Domene	22.7	3. Dierken	47.2
4. Dierken	22.9	4. Grady	48.5
5. Grady	24.3	5. R-O’Bryan	49.0
6. Locke	24.6	6. Locke	49.4
7. R-O’Bryan	25.1	7. Stein	49.9
8. Michels	25.6	8. L-Matis	51.0
9. Corman	26.1	9. Gibson	51.2
10. L-Matis	26.1	10. Kostecki	51.6
		11. Bidwell	51.8
		12. Corman	51.8
		13. Michels	51.8
		14. C-O’Bryan	51.9
		15. Burnett	52.8
		16. Snook	53.0
		17. Callahan	53.1
		18. Barber	53.4
		19. Burns	53.7
		20. Recktenwald	53.7
		21. Dillman	54.1
		22. Scheller	54.5
		23. Jenkins	55.8
		24. Golightly	56.1
		25. Renz	56.2
		26. Rodighiero	56.2
		27. A-Matis	56.8
		28. Grendi	57.2
		29. Turchetta	57.8
		30. Hans	58.3
		31. Young	58.7
		32. Sanders	1:01.3
		33. Elder	1:01.6

Converting Fast 300s to 400m potential
(HS girls)

Fast 300	400m (Average)		400m (Mercier)	400m (300*1.407)	400m (300*1.413)	400m (Purdy)	400m (Cameron)
41.0	58.3		57.4	57.7	57.9	58.7	59.6
41.5	58.9		58.0	58.4	58.6	59.4	1:00.3
42.0	59.7		58.7	59.1	59.3	1:00.2	1:01.0
42.5	1:00.4		59.5	59.8	1:00.1	1:00.9	1:01.8
43.0	1:01.1		1:00.2	1:00.5	1:00.8	1:01.7	1:02.5
43.5	1:01.8		1:00.9	1:01.2	1:01.5	1:02.4	1:03.2
44.0	1:02.6		1:01.6	1:01.9	1:02.2	1:03.2	1:04.0
44.5	1:03.3		1:02.3	1:02.6	1:02.9	1:03.9	1:04.7
45.0	1:04.0		1:03.0	1:03.3	1:03.6	1:04.7	1:05.4
45.5	1:04.7		1:03.7	1:04.0	1:04.3	1:05.5	1:06.1
46.0	1:05.4		1:04.4	1:04.7	1:05.0	1:06.2	1:06.9
46.5	1:06.2		1:05.1	1:05.4	1:05.7	1:07.0	1:07.6
47.0	1:06.9		1:05.8	1:06.1	1:06.4	1:07.8	1:08.3
47.5	1:07.6		1:06.5	1:06.8	1:07.1	1:08.5	1:09.0
48.0	1:08.3		1:07.2	1:07.5	1:07.8	1:09.3	1:09.8
48.5	1:09.0		1:07.9	1:08.2	1:08.5	1:10.1	1:10.5
49.0	1:09.7		1:08.6	1:08.9	1:09.2	1:10.8	1:11.2
49.5	1:10.5		1:09.3	1:09.7	1:09.9	1:11.6	1:11.9
50.0	1:11.2		1:10.0	1:10.4	1:10.7	1:12.4	1:12.7

Predictive ability gets better as runners get older/stronger
Younger distance kids tend to run slower 400s than what this chart predicts