

Task Specificity in Testing and Training

Max Velocity

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Definition of Task Specificity

- Performing, training or identifying SPECIFIC, (as opposed to GENERAL), details of a particular task

Maximum Velocity

- Will be assessed, for the purposes of this presentation, as the fastest 10, 20 or 30m segment in a particular race or test

Examples of Max Velocity Segments

1999 World Championships, Sevilla ESP

Wind: +0.2m/s

Maurice Greene		0.132								
1.86	2.89	3.81	4.69	5.55	6.39	7.24	8.09	8.94	9.80	
1.86	1.03	0.92	0.88	0.86	0.84	0.85	0.85	0.85	0.86	
1.73	2.76	3.67	4.56	5.42	6.27	7.11	7.96	8.81	9.67	
Bruny Surin		0.127								
1.88	2.88	3.79	4.68	5.53	6.38	7.24	8.10	8.96	9.84	
1.88	1.00	0.91	0.89	0.85	0.85	0.86	0.86	0.86	0.88	
1.75	2.75	3.67	4.56	5.41	6.25	7.12	7.98	8.84	9.72	
Dwain Chambers		0.140								
1.87	2.89	3.81	4.71	5.57	6.41	7.29	8.18	9.07	9.97	
1.87	1.02	0.92	0.90	0.86	0.84	0.88	0.89	0.89	0.90	
1.73	2.75	3.67	4.57	5.43	6.27	7.15	8.04	8.93	9.83	
Obadele Thompson		0.145								
1.91	2.93	3.85	4.76	5.63	6.50	7.36	8.24	9.12	10.00	
1.91	1.02	0.92	0.91	0.87	0.87	0.86	0.88	0.88	0.88	
1.77	2.79	3.71	4.62	5.49	6.36	7.22	8.10	8.98	9.86	
Tim Harden		0.136								
1.87	2.89	3.81	4.71	5.60	6.47	7.33	8.22	9.11	10.02	
1.87	1.02	0.92	0.90	0.89	0.87	0.86	0.89	0.89	0.91	
1.74	2.76	3.67	4.58	5.47	6.34	7.20	8.09	8.98	9.89	
Tim Montgomery		0.136								
1.91	2.95	3.88	4.77	5.65	6.52	7.39	8.28	9.16	10.04	
1.91	1.04	0.93	0.89	0.88	0.87	0.87	0.89	0.88	0.88	
1.78	2.82	3.75	4.64	5.52	6.39	7.26	8.15	9.03	9.91	
Jason Gardner		0.142								
1.91	2.93	3.85	4.74	5.62	6.51	7.40	8.28	9.17	10.07	
1.91	1.02	0.92	0.89	0.88	0.89	0.89	0.88	0.89	0.90	
1.77	2.79	3.71	4.60	5.48	6.37	7.26	8.14	9.03	9.93	
Kareem Streete-Thompson		0.173								
1.97	2.99	3.93	4.83	5.72	6.61	7.50	8.38	9.31	10.24	
1.97	1.02	0.94	0.90	0.89	0.89	0.89	0.88	0.93	0.93	
1.80	2.82	3.76	4.66	5.55	6.44	7.33	8.21	9.14	10.07	

**USATF Women's Sprint Development
Women's 100m Finals**

**2004 USA Olympic Trials
Sacramento, CA**

Date: 7.10.04 Wind: 0.1

100 Meters		Lane 8	Lane 7	Lane 6	Lane 5	Lane 4	Lane 3	Lane 2	Lane 1
ATHLETE		Angela Daigle	Muna Lee	Marion Jones	Lauryn Williams	Torri Edwards	LaTasha Colander	Angela Williams	Gail Devers
PLACE		8	6	5	3	2	1	7	4
10m	Cumulative	2.03	2.06	2.04	2.08	2.05	2.08	2.03	2.04
	Velocity (m/s)	4.93	4.85	4.90	4.81	4.88	4.81	4.93	4.90
	Interval	1.12	1.13	1.17	1.13	1.10	1.11	1.09	1.07
20m	Cumulative	3.15	3.19	3.21	3.21	3.15	3.19	3.12	3.11
	Velocity (m/s)	8.93	8.85	8.55	8.85	9.09	9.01	9.17	9.35
	Interval	1.02	1.04	1.03	1.02	1.02	1.04	1.03	1.05
30m	Cumulative	4.17	4.23	4.24	4.23	4.17	4.23	4.15	4.16
	Velocity (m/s)	9.80	9.62	9.71	9.80	9.80	9.62	9.71	9.52
	Interval	1.02	1.00	0.99	0.99	0.97	0.96	1.01	0.97
40m	Cumulative	5.19	5.23	5.23	5.22	5.14	5.19	5.16	5.13
	Velocity (m/s)	9.80	10.00	10.10	10.10	10.31	10.42	9.90	10.31
	Interval	0.97	0.95	0.95	0.95	0.94	0.95	0.97	0.95
50m	Cumulative	6.16	6.18	6.18	6.17	6.08	6.14	6.13	6.08
	Velocity (m/s)	10.31	10.53	10.53	10.53	10.64	10.53	10.31	10.53
	Interval	0.98	1.02	0.98	0.99	0.97	0.97	1.01	0.99
60m	Cumulative	7.14	7.20	7.16	7.16	7.05	7.11	7.14	7.07
	Velocity (m/s)	10.20	9.80	10.20	10.10	10.31	10.31	9.90	10.10
	Interval	1.00	0.96	0.97	0.97	0.98	0.93	0.96	0.97
70m	Cumulative	8.14	8.16	8.13	8.13	8.03	8.04	8.10	8.04
	Velocity (m/s)	10.00	10.42	10.31	10.31	10.20	10.75	10.42	10.31
	Interval	1.02	1.00	0.98	0.97	0.97	0.96	1.03	1.00
80m	Cumulative	9.16	9.16	9.11	9.10	9.00	9.00	9.13	9.04
	Velocity (m/s)	9.80	10.00	10.20	10.31	10.31	10.42	9.71	10.00
	Interval	1.01	0.98	0.99	0.98	1.00	0.97	1.04	1.01
90m	Cumulative	10.17	10.14	10.10	10.08	10.00	9.97	10.17	10.05
	Velocity (m/s)	9.90	10.20	10.10	10.20	10.00	10.31	9.62	9.90
	Interval	1.06	1.03	1.04	1.02	1.02	1.00	1.06	1.06
100m	Cumulative	11.23	11.17	11.14	11.10	11.02	10.97	11.23	11.11
	Velocity (m/s)	9.43	9.71	9.62	9.80	9.80	10.00	9.43	9.43

Max Velocity Calculation

-Velocity in general is defined as the change in distance/change in time

-In this case, Maximum Velocity = Stride Length (SL) x Stride Frequency (SF) of a particular segment

-To be specific, both factors need to be broken down and assessed

Stride Length

- The distance covered from toe off on one leg to toe touchdown of the opposite leg during sprinting
- Has been proven to have a direct correlation to an athletes leg (trochanter) length

Stride Frequency

- In this case, is defined as the # of strides, or percentage of, that an athlete can complete (from toe touchdown to toe touchdown) per each 1 second interval

Types of Tests and Reasons

- OHB/UHF - General Power/as relates to muscular coordination
- SLJ – Starting Strength/Power
- 3 x J- Acceleration Strength/Power
- 5 x J - Reactive power correlating with speed/frequency
- 10 x J - Power as relates to stride length/elasticity
- 40-45 second run-tests for speed endurance
- 30m standing or block test-block clearance/acceleration capacities
- 30m Flying - Assessment of Maximum Velocity capabilities

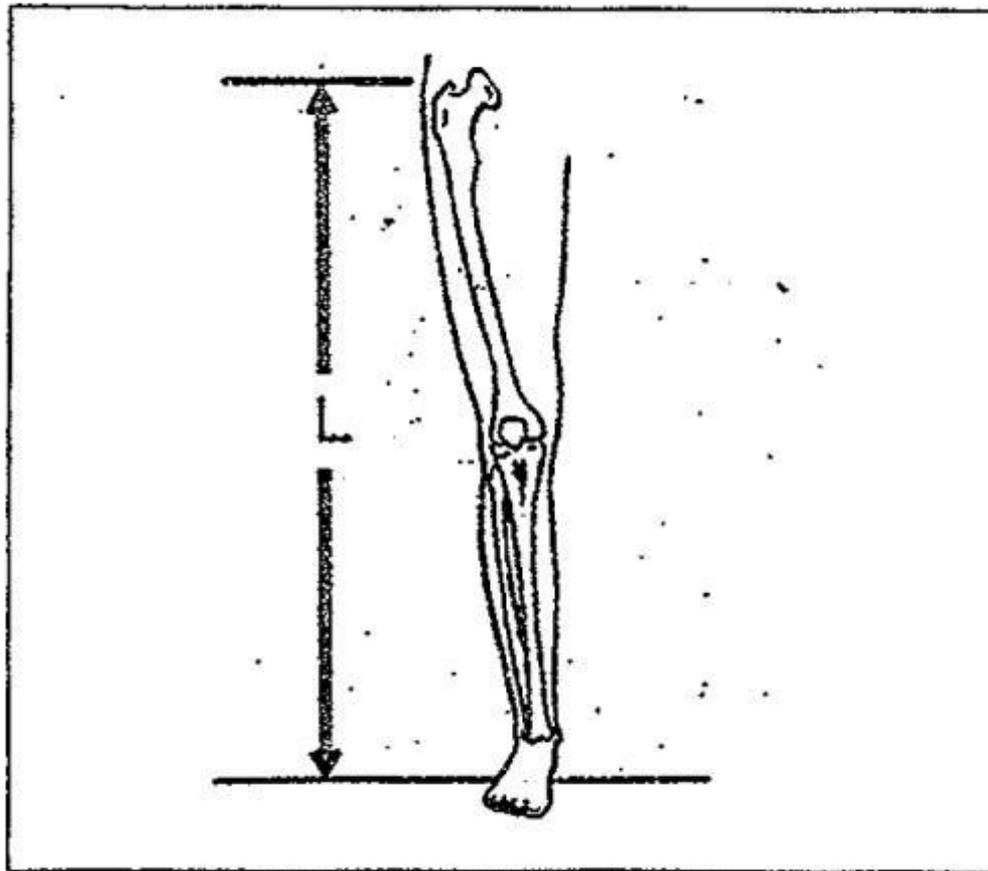
Athlete Inventory

- Every Sprint Coach should know this to create a specific “model” for an individual athlete
 - Stride Length (at Max/Peak V)
 - Stride Frequency (at Max/Peak V)
 - Trochanter Length

Trochanter Length

- Trochanter length is a necessary factor to be aware of to assess an athlete's stride length as it SPECIFICALLY relates to him/her.
- The trochanter length is assessed/measured from the top of the greater trochanter to the ground in bare feet. It should be measured in centimeters.

Trochanter



Testing for Max Velocity

- Goals of Testing
 - Overall time of the total segment
 - Breaking down of the segments
 - Max Segment
 - SL
 - SF

30m Fly Testing

- Standard testing with 30 meter run-in to 30 meters flying at top speed. If possible, BREAK UP INTO 10m SEGMENTS.
- Equipment
 - Automatic Timing System
 - Freelap
 - Brower
- Film Capturing Device/System
 - iPad, iPhone, video camera
 - Dartfish, Dartfish Express, Coaches Eye, etc.

Assessment From Video

- Add 30 fly video here

Desired Test Results

- Maximum Velocity (fastest 10m segment if possible)
 - 30m or 10m/Time
- Stride Frequency
 - # of strides timed from touchdown to touchdown (use 5) strides in or closest to the fastest segment
- Stride Length
 - $\text{Max } V/SF = SL$

Comparison to “Norms”

- Stride Length (as per studies by Levtshenko, Tabatshnik, et. al) **AT MAX V** should be:
 - 2.35 x Troch Length for Females
 - 2.43 x Troch Length for Males
- Stride Frequency (as per various studies) should be 4.5-5.0 strides/sec. Over 5.0-5.25 is approaching maximal SF.

Example: Athlete A Test Results

- Female Sprinter, Troch Length .92
- 30m Fly Test = 3.15
- Fastest 10m Segment: 1.04
- SF = 5 stride of 1.02 for 6 touchdowns

Calculations of Test Results

- $\text{Max } V = 10\text{m} / 1.04\text{sec} = 9.61\text{m/sec}$
- $\text{SF} = \# \text{ of Strides } (5) / \text{Time } (1.02) = 4.90$
- $\text{SL} = \text{MV } (9.61\text{m/sec}) / \text{SF } (4.90 \text{ strides/sec}) = 1.96\text{m}$

Optimal Efforts

- Optimal vs. Maximal numbers for SL and SF

**TARGET STRIDE LENGTH AND STRIDE FREQUENCY VALUES
FOR OBTAINING DESIRED MAXIMUM VELOCITIES**

		Stride Frequency in Strides Per Second														
		5.25	5.20	5.10	5.00	4.90	4.80	4.70	4.60	4.50	4.40	4.30	4.20	4.10	4.00	3.90
Velocity in Meters Per Second	12.00	2.28	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.66	2.72	2.79	2.85			
	11.75	2.24	2.25	2.30	2.35	2.39	2.45	2.50	2.55	2.61	2.67	2.73	2.79	2.86		
	11.50	2.19	2.21	2.25	2.30	2.34	2.40	2.44	2.50	2.55	2.61	2.67	2.74	2.80	2.87	
	11.25	2.14	2.16	2.20	2.25	2.29	2.34	2.39	2.44	2.50	2.55	2.62	2.68	2.74	2.81	2.88
	11.00	2.09	2.11	2.15	2.20	2.24	2.29	2.34	2.39	2.44	2.50	2.56	2.62	2.68	2.75	2.82
	10.75	2.05	2.06	2.10	2.15	2.19	2.24	2.28	2.33	2.38	2.44	2.50	2.56	2.62	2.69	2.76
	10.50	2.00	2.01	2.05	2.10	2.14	2.19	2.23	2.28	2.33	2.38	2.44	2.50	2.56	2.63	2.69
	10.25	1.95	1.97	2.00	2.05	2.09	2.14	2.18	2.22	2.27	2.32	2.38	2.44	2.50	2.56	2.63
	10.00	1.90	1.92	1.96	2.00	2.04	2.08	2.12	2.17	2.22	2.27	2.33	2.38	2.44	2.50	2.56
	9.75	1.86	1.87	1.91	1.95	1.98	2.03	2.07	2.11	2.16	2.21	2.27	2.32	2.37	2.44	2.50
	9.50	1.81	1.82	1.86	1.90	1.93	1.98	2.02	2.06	2.11	2.15	2.21	2.26	2.31	2.38	2.44
	9.25	1.76	1.77	1.81	1.85	1.88	1.93	1.96	2.01	2.05	2.10	2.15	2.20	2.25	2.31	2.37
	9.00	1.71	1.73	1.76	1.80	1.83	1.86	1.91	1.95	2.00	2.04	2.09	2.14	2.19	2.25	2.31
	8.75	1.66	1.68	1.71	1.75	1.78	1.82	1.86	1.90	1.94	1.98	2.03	2.08	2.13	2.18	2.24
	8.50	1.61	1.63	1.66	1.70	1.73	1.77	1.80	1.84	1.88	1.93	1.97	2.02	2.07	2.12	2.17
	8.25	1.57	1.58	1.61	1.65	1.68	1.71	1.75	1.79	1.83	1.87	1.91	1.96	2.01	2.06	2.11
8.00	1.52	1.53	1.56	1.60	1.63	1.66	1.70	1.74	1.77	1.81	1.86	1.90	1.95	2.00	2.05	
7.75	1.46	1.49	1.51	1.55	1.58	1.61	1.64	1.68	1.72	1.76	1.80	1.84	1.89	1.93	1.98	
7.50	1.42	1.44	1.47	1.50	1.53	1.56	1.59	1.63	1.66	1.70	1.74	1.78	1.82	1.87	1.92	

Creating a Model Athlete (task specificity)

- SL norms $2.35(f) / 2.43(m) \times \text{Troch Length}$
- SF norms (approaching 5.0 Strides per/second)
- Athlete A
 - $SL = TL (.92) \times 2.35(f) = 2.16m$
 - $SF = 5.0 \text{ s/sec}$
- Max V for Athlete A
 - $SL \times SF = 2.16m \times 5.0 \text{ s/sec} = 10.8m/s$

Comparison to Model

- Max V: Athlete A = 9.61m/sec vs. Model = 10.8m/sec
- SL: Athlete A = 1.96m vs. Model = 2.16m
- SF: Athlete A = 4.90s/sec vs. Model = 4.5-5.0s/sec
- In Comparison:
 - SL is deficient by 9.3%
 - SF is deficient by 2.0%

Task Specific Goal

- Improve SL by a minimum 2%
- A 2% improvement in SL pushes the length up to 2.0m
- If we maintain SF at 4.9:
 - Max V now = 9.8 m/sec
 - $10\text{m}/9.8 = 1.02 \text{ sec}$
 - New 30m Fly projection is 3.06 vs. previous best of 3.15

Projections From Improvement

- Old 30m Fly time projected out to 11.28
 - $30\text{m}/30\text{ fly} - .12(\text{CF}) = \text{Vel}$
 - $30/3.03 = 9.90$
 - $100/\text{vel} = 100\text{ time} - \text{acc component and reaction time}$
 - $100/9.90 = 10.10$
 - Add 1.18 for reaction and acceleration
 - $10.10 + 1.18 = 11.28$

- New 30m Fly time projects out to 10.98

Conclusions

- By specifically addressing one parameter minimally and maintaining the other, this athlete has gone from being a possible NCAA qualifier to being a possible NCAA Champion.
- The key is to SPECIFICALLY identify possible deficits, THEN, identify those exercises and training routines that directly affect SL and SF and address those individually and not in a general sense.