Stability Training in Young Throwers as Applied to the Linear Shot.

Brian Masterson
El Dorado High School

Who is this Guy?

- Bend High School; Bend, Oregon
  - Discus 164-5, Jav 201-2, Shot 51-10
- Stanford University
  - Hammer 70.06m (229-10) school record.
  - 4th NCAA's, 3rd Pac-10's (1985)
- US National Championships.
  - Hammer, 7th, 8th, 13th
- Olympic Trials 1988.

Who is This Guy

- Along the way I trained with some fantastic people:
  - Mick Craven
  - Tim Fox
  - John Powell
  - Carol Cady
  - The Nickerson's
  - Stewart Togher
  - Lance Deal

Who is this Guy?

- Some past students:
  - Steve Oxenford, Willamete High School
    - 53 ft shot, Oregon State meet
  - John Badovinac
    - 200 ft hammer throw (16#) as US Junior
  - Carley Fowler
    - 35-1 shot as sophomore at EDHS.
  - Keith Baker UCSB & Samford
  - Emily Allen, Samford University
    - 200-1 hammer at 145# body weight.

Who is this Guy?

- Currently: Throws Coach El Dorado High School: Placerville, CA.
  - Boys and Girls
  - Inclusive Programs
- Monday-Friday 6am-3pm
  - Mechanical Engineer
  - Balanced Body Inc.

Goals:

- Thought Provoking Discussion
  - Training that helps assure athletes make it to the end of the season.
  - Training for a wide range of ages, coordinations, and skills.
  - Training that applies to all athletes.
  - Limited resources training option.
  - Developing interesting people.
  - Coaching ideas to apply to your athletes.

Route 101

- It's all about PR. (5 min)
- Stability, Mobility. (1 min)
- Basic Physics. (15 min)
  - How fast = how far.
  - Acceleration over pathlength increases speed.
  - Push how hard?

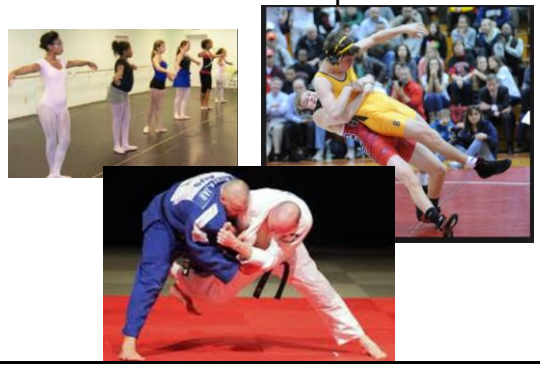
Route 101

  - Developing athletes- progression (5 min)
  - Simple view of linear shot. (5 min)
  - Where can stability training physically help the technical aspects? (20 min)
  - Training throws. (5 min)
  - Competition. (10 min)
- Open Book Quiz. (tbd).

PR – Posture & Rhythm

- First rule of the Oregon Hammer School:
  - If you have posture you can have rhythm. If you have rhythm you can throw.
- Posture- the first requirement.
  - Orientation or alignment of the various parts of the body.
  - Position plus
    - Weight- center of gravity
    - Intent of motion or action
    - Action.
    - Indicator of past actions.
  - Kinesthetic awareness.
  - Emotional tell tale.
  - Walk like Buzz.

Posture examples



Shot Put Postures

Posture & Rhythm

- Rhythm- the second requirement
  - The speed or change in speed when progressing through a sequence of motions.
  - Rhythms are one of the few feelings that an athlete can successfully store and recall.
  - Pushing harder on the shot does not make it go farther. Pushing the shot faster makes it go farther.
  - Love your band kids they understand bpm.

Posture & Rhythm

- John Wooden:
  - Advice to the UCLA basketball team before winning the NCAA championship game (Bill Walton era).

    "Don't rush, you skip small things, simply speed things up 5%."

    He changed the rhythm of the game. They won.

Posture & Rhythm

- How can you teach an athlete to go faster than they have ever gone?
  - Bean bag example.
  - Lines on the track.
  - Extrapolations.

Posture & Rhythm

- Failure modes at increased speed.
  - Posture
  - Control of body motions
- Can stability training fix these issues?

Stability and Mobility

- Stability: the ability to hold a posture against a force.
- Mobility: the ability to move from one posture to another.

Basic Physics-Projectiles

	12 lbs								
5.454545	kg	shot							
-9.81	m/s	gravity							
1.75	m	release height			sin theta	cos theta	v=v0 +at	x=xo + vo*t +1/2*a*t^2	
40	degrees	release angle			0.642788	0.766044	t=(v-v0)/a		
0.698132	radians								
1	m/s	step							
/_0	V_up	V_horz		t when v_up = height		time to earth	total flight	Horz Meters	Horz FT
0	0	0		0.00	1.75	0.60	0.60	0.00	0.00
1	0.64	0.77		0.07	1.77	0.60	0.67	0.51	1.67
2	1.29	1.53		0.13	1.83	0.61	0.74	1.14	3.73
3	1.93	2.30		0.20	1.94	0.63	0.83	1.90	6.22
4	2.57	3.06		0.26	2.09	0.65	0.91	2.80	9.19
5	3.21	3.83		0.33	2.28	0.68	1.01	3.86	12.67
6	3.86	4.60		0.39	2.51	0.72	1.11	5.09	16.71
7	4.50	5.36		0.46	2.78	0.75	1.21	6.50	21.31
8	5.14	6.13		0.52	3.10	0.79	1.32	8.08	26.51
9	5.79	6.89		0.59	3.46	0.84	1.43	9.85	32.32
10	6.43	7.66		0.66	3.86	0.89	1.54	11.81	38.74
11	7.07	8.43		0.72	4.30	0.94	1.66	13.96	45.79
12	7.71	9.19		0.79	4.78	0.99	1.77	16.30	53.48
13	8.36	9.96		0.85	5.31	1.04	1.89	18.84	61.81
14	9.00	10.72		0.92	5.88	1.09	2.01	21.58	70.78
15	9.64	11.49		0.98	6.49	1.15	2.13	24.51	80.39

Basic Physics

- Lesson from the spreadsheet.
  - Small amounts of change in speed can mean comparatively large changes in distance.
  - Others?

Basic Physics

what a difference .1 m/s can make

V_0	V_up	V_horz	t when v_up = height	time to earth	total flight	Horz Meters	Horz FT
9.5	6.10648	7.27742	0.62	3.65	0.86	1.49	10.81	35.45
9.6	6.17	7.35	0.63	3.69	0.87	1.50	11.01	36.10
9.7	6.24	7.43	0.64	3.73	0.87	1.51	11.20	36.75
9.8	6.30	7.51	0.64	3.77	0.88	1.52	11.40	37.41
9.9	6.36	7.58	0.65	3.81	0.88	1.53	11.61	38.07
10	6.43	7.66	0.66	3.86	0.89	1.54	11.81	38.74
10.1	6.49	7.74	0.66	3.90	0.89	1.55	12.02	39.42
10.2	6.56	7.81	0.67	3.94	0.90	1.56	12.23	40.10
10.3	6.62	7.89	0.67	3.98	0.90	1.58	12.44	40.79
10.4	6.68	7.97	0.68	4.03	0.91	1.59	12.65	41.49
10.5	6.75	8.04	0.69	4.07	0.91	1.60	12.86	42.19
10.6	6.81	8.12	0.69	4.12	0.92	1.61	13.08	42.90
10.7	6.88	8.20	0.70	4.16	0.92	1.62	13.30	43.61
10.8	6.94	8.27	0.71	4.21	0.93	1.63	13.52	44.33
10.9	7.01	8.35	0.71	4.25	0.93	1.65	13.74	45.06
11	7.07	8.43	0.72	4.30	0.94	1.66	13.96	45.79

Acceleration vs. Distance

Acceleration over a pathlength.

'V^2 = Vo^2 + 2*a*(x-xo) assume Vo equals 0

	assume	60	m/s^2	acceleration	18.2927 ft/s^2
	goal	11	m/s	(45.8 ft)	
	0.2	step			
	pathlength				
inches	meters	V=		distance thrown	
0.00	0	0.00			
7.87	0.2	4.90			
15.75	0.4	6.93		20.97	
23.62	0.6	8.49		29.28	
31.50	0.8	9.80		37.41	
39.37	1	10.95		45.43	
47.24	1.2	12.00		53.48	
55.12	1.4	12.96		61.46	
62.99	1.6	13.86			
70.87	1.8	14.70			
78.74	2	15.49			
86.61	2.2	16.25			
94.49	2.4	16.97			

Force Req'd, Const Acceleration

Acceleration over a pathlength.

'V^2 = Vo^2 + 2*a*(x-xo) assume Vo equals 0

	assume	60	m/s^2	acceleration	18.2927 ft/s^2	
	goal	11	m/s	(45.8 ft)		
	0.2	step				
	pathlength				12 # shot	4 kg shot
inches	meters	V=		distance thrown	force req'd	force req'd
0.00	0	0.00				
7.87	0.2	4.90				
15.75	0.4	6.93		20.97	73.6	54.0
23.62	0.6	8.49		29.28	73.6	54.0
31.50	0.8	9.80		37.41	73.6	54.0
39.37	1	10.95		45.43	73.6	54.0
47.24	1.2	12.00		53.48	73.6	54.0
55.12	1.4	12.96		61.46	73.6	54.0
62.99	1.6	13.86				
70.87	1.8	14.70				
78.74	2	15.49				
86.61	2.2	16.25				
94.49	2.4	16.97				

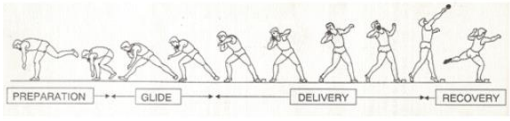
Developing Athletes

- Work on developing an athlete first.
  - Maybe they'll be a thrower too.
  - From Schmolinsky pg 106
    - Build-up training (13-19 yrs) expectation for 15m putter
      - 100 m 12.0 sec
      - Long jump 6.0 m
      - High jump 1.65 m
      - 110 hurdles 16.5 sec
      - 400 m 56.0 sec
  - Most throwers peak 25-32 years old.

Developing Athletes

- Rotational skills: fundamental development:
  - Last chance 15-18 years.
  - Give them the best future possible.
- Athletes should continue to improve beyond high school.
- Leave room for future improvement.

Linear Shot – Simplified

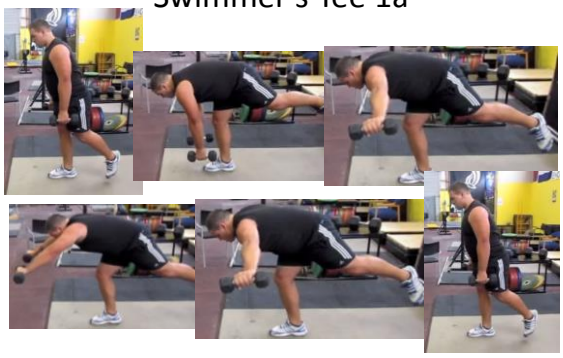


1 2 3 4 5 6 7 8 9 10

Linear Shot-1

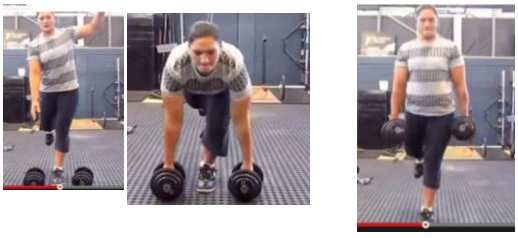
- Prep (positions 1 & 2 start of 3) in the back of the ring:
  - Requirements
    - Balanced position
    - Able to lean over
    - Control of blocking leg.
  - Stability exercises
    - Didier Poppe: Conditioning Stabilization Drills
      - https://www.youtube.com/watch?v=nBhc6linBig
      - Swimmer's tee
      - Balance Beam work
      - Bosu

Swimmer's Tee 1a



Swimmer's Tee -1b

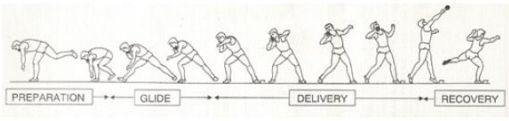
Swimmer's Tee -1c



Balance Beam Work

Bosu

Linear Shot



1 2 3 4 5 6 7 8 9 10

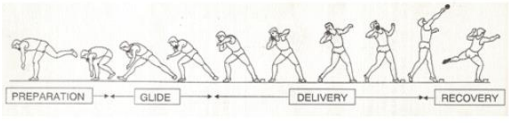
Linear Shot-Middle of the Ring

- Positions 4 & 5
  - Landing of both feet
  - Weight over right foot
  - Shot beyond right foot
  - Shoulders square to back of ring.
- Didier Poppe: Stabilization Conditioning
  - Military sequence with bar
    - https://www.youtube.com/watch?v=nBhc6linBig
  - Walking lunge with twist
    - https://www.youtube.com/watch?v=XgJNwScjEAc

Positions 4 & 5

Positions 4, 5, & 6

Linear Shot



1 2 3 4 5 6 7 8 9 10

Linear Shot – The Finish

Positions 8 and 9

- Post leg must provide stability.
- Torso must hold torque.
- Right foot, right leg, hips, torso, shoulders, arms.
- Sequence from **atletiektrainer.nl**
  - http://vimeo.com/31694570

Positions 4, 5, 6, 7, 8, & 9

Linear Shot-Finish

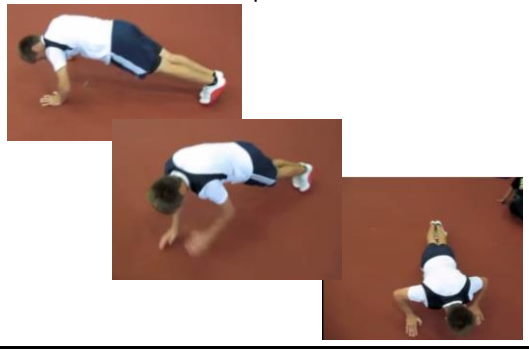
- Can we help this with stability training?
  - Didier Poppe: Stabilization Conditioning
    - https://www.youtube.com/watch?v=nBhc6linBig
    - Circle Push ups
  - Didier Poppe: Shot Put Conditioning Part 3, The Arms
    - https://www.youtube.com/watch?v=lWaeIvrsu_M
    - Barbell flicks
    - Med ball pushups
    - Dumbell press

Linear Shot – The Finish

Combination Work ?

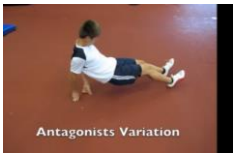
Linear Shot – The Finish

Push-up Circles



Linear Shot – The Finish

Don't Forget the Antagonists



Linear Shot – The Finish

Barbell Flicks – Combination Work

Linear Shot – The Finish

Med Ball Push Ups – Combination Work




Linear Shot – The Finish

Dumbell Press – Combination Work

Training Throws

- Training throws are the single best method for improving the competition result
  - Transfer of Training in Sports, Vol I & II. Anatoliy P. Bondarchuk.
  - Simulations of throws are next best.
  - Coaches see positions and motions. Athletes get feelings.
    - Some translation is required.
    - Drills allow athletes to feel positions
    - Drills should be structured to work through positions to the finish.

Training Throws

- The whole attempt will take less than a second.
  - Train to get to the end.
  - Training to stop in the middle does not result in a rhythm that can be used.
    - Rhythms are the strongest memory athletes have.
    - All rhythms should build into the full throw.
    - English school kids technique example.

Training Throws

- As much as 75% of training throws can be for rhythm.
  - Use distance targets to generate different rhythms and control intensities.
    - Rhythm is controlled by the legs.
    - Finish with the arm at full effort.
    - Similar to jump or dive – 45, 48, 43 hit the desired line.
    - Progressions: 43, 44, 45, 46
      - They will develop a feeling for what 47 should be like even if they have a PR of only 46.
      - Lines of the track with indoor shots.
      - Carley, 3 weeks of 1 ft PR's at end of last year.
    - Going faster, not pushing harder.

Training Throws

- Finish every throw without fouling, all year long.
  - It is a good habit.
  - Keeps athlete from over extending.
  - Promotes a stabile landing.
  - Keep what you have earned.

Competition

- Competition results will reflect the year's training.
  - Warm-up.
    - Good warm-ups reset the body to a neutral condition. Residual effects of the previous training can be erased.
    - Good warm-ups will get the athlete ready to have a maximum throwing effort with only 2 warm-ups.
      - Get them ready for section, division, and state meets.
      - Speeds up all the other meets of the year.
      - Can be a great way to get rid of a poor showing in prelims and get ready for finals.

Competition

- Warm-up Cont.
  - Dynamic warm up
    - Skips, hops, running, etc
  - Use shots for stability exercises at a meet.
    - Swimmers Tee,
    - Military sequence with shot in each hand.
  - Circle push-ups.
  - Each athlete will react a little different.
  - Better to warm up twice than stand around and get nervous.

Competition

- Have a game plan that relies on rhythms they know and can reproduce: Confidence.
  - Stand throw 30 ft
  - English school kids, 35 ft
  - First throw, 36 ft
  - Second throw 38 ft
  - Third throw 40 ft
  - Finals reset all distances 1 foot farther.

References:

- Transfer of Training in Sports, Vol I, Vol II, Anatoliy P. Bondarchuk. Ultimate Athletic Concepts, Michigan.
- Every Day is Game Day, Mark Verstegen, Penguin, NY, NY.
- Track and Field: The East German Textbook of Athletics, Gerhardt Schmolinsky, Sports Book Publisher.