The Pole Vault

Getting Your New Program to Year Two

and

Other Related Topics

Wilson SooHoo, Hoka One One SuperClinic

January 30, 2016

The Speaker

Wilson SooHoo, MD

- Champion pole vaulter?
- Master coach?
- Authoritative researcher?
- Book/video author?

Goals of Talk

- Background of pole vaulting:
  - Equipment.
  - Efforts to make the sport safer.
  - Efforts to increase performance.
- Teaching beginners and getting your new program to the second year.

History of the Pole Vault

Stolen Liberally

From

Peter McGinnis, Ph.D.

Wooden Pole Era (1800's)

(Heights less than 3.66 m ~ 12'0)

- Heavy wooden poles ~ ash, hickory.
- Sod or turned over sod landing pits.
- Grass or dirt runways.
- No box ~ spike or tripod on end of pole.

Wooden Pole Era (1800's)

Bamboo Pole Era (1900-1945)

(3.66 - 4.76 m ~ 12'0 – 15'7 3/4)

- Lighter bamboo poles:
  - built in handgrips.
  - slightly flexible.
- Sawdust, sand, sod, or wood chip pits.
- Cinder runways.
- Vault boxes introduced.

Bamboo Era

- 1912 ~ 13'0

Bamboo Era

- 1912 ~ 13'0
- 1927 ~ 14'0
- 1940 ~ 15'0
  Cornelius Warmerdam
  1942
  15'7 3/4

Steel Pole Era (1945-1960)

(4.80 m ~ 15'9 1/4)

- Man-made steel poles.
- Bags of shredded foam rubber introduced.
- All-weather track surfaces introduced.
- Metal boxes.

Steel Era

- Don Bragg:
  - 1959 – 15'9 ¼.
  - 1960 Olympic Champion.
  - Last world record set on steel pole.

Fiberglass Pole Era (1960-?)

(4.83 - 6.15 m ~ 15'10 1/4 – 20'2)

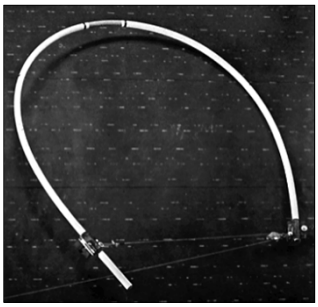
- Light and flexible composite poles
- Larger latticed foam rubber pits
- All-weather runways
- Vault box modified to accommodate pole bend

Flexible Fiberglass Poles

Fiberglass Pole Era (1960-?)

(4.83 - 6.15 m 15'10 1/4 – 20'2)

- Light and flexible fiberglass poles



Fiberglass Pole Era (1960-?)

(4.83 - 6.15 m ~ 15'10 1/4 – 20'2)

- 1986: Nordic Sport introduces pole with carbon fiber.
- Gill Athletics now the largest manufacturer of carbon/fiberglass poles.

Fiberglass Era

- 1962 – 16'0
- 1963 - 5.00 m
- 1963 – 17'0
- 1970 – 18'0
- 1972 - 5.50 m
- 1981 – 19'0
- 1985 - 6.00 m
- 1991 – 20'0

Fiberglass Pole Era (1960-?)

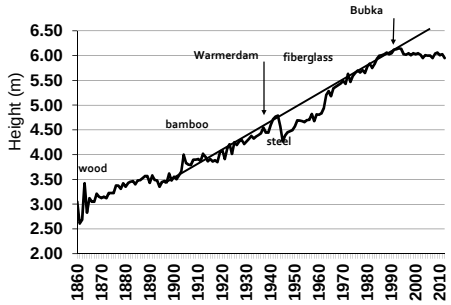
(4.83 - 6.15 m ~ 15'10 1/4 – 20'2)

- Larger latticed foam pits.

Fiberglass Era

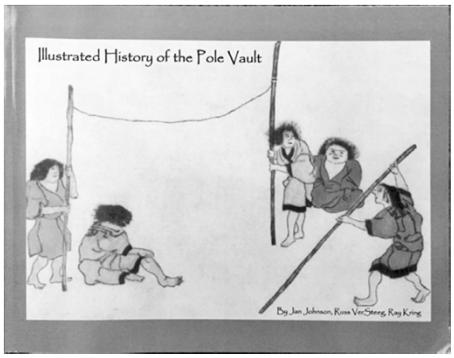
- 2000 Women's Pole Vault introduced to Olympic Games.

Performance Progression



Illustrated History of the Pole Vault

Jan Johnson, Russ VerSteeg, Ray Kring



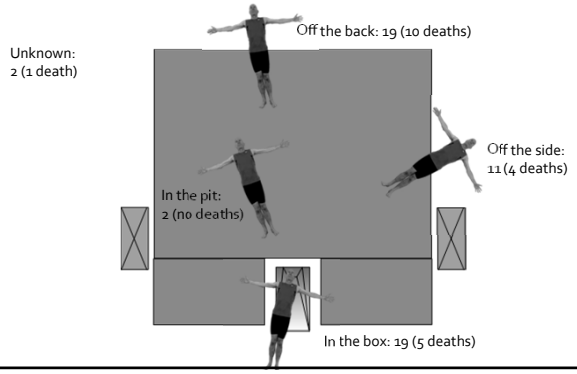
Injury Prevention

2001 Injury Study

- Boden BP, Pasquina P, Johnson J, & Mueller FO. (2001). Catastrophic injuries in pole-vaulters. Am J Sports Med 29:50-54.
- Review of catastrophic injuries and deaths in pole vaulting from 1982-1998.

Catastrophic Injuries and Deaths

1971-2002: 53 incidents - 20 deaths



Pole Vault ~ 1973

Pole Vault ~ 1975

Hard Surfaces Around Pit

Unsafe Facility

2002 Pole Vault Accidents

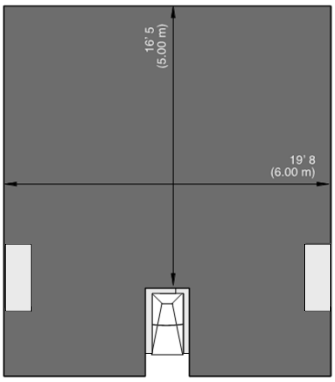
- 6 catastrophic injuries including 3 deaths.
- 3 pole vaulters killed in pole vault accidents in the months of February and March alone.

Injury Prevention – Reduce Risk

- Tools:
  - Improve equipment.
  - Educate coaches and athletes.
  - Use rules to implement changes.

Landing Pit

- Increase size
- Pad standard bases
- Pad area between pit and box (box collar)

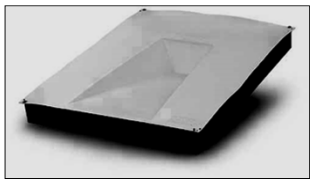


Padding Hard Surfaces

- Remove or pad any hard surfaces around landing pad.
- Pad hard surface between box and landing pad with box collar.

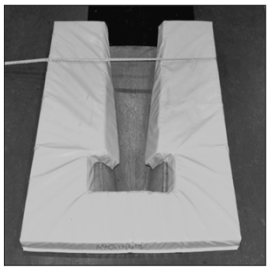
Padding the Box Area

- Replace bottom of box with softer material
- Replace steel and concrete box with soft box



Padding the Box Area

- Improve padding around box.
- Replace bottom of box with softer material.
- Replace steel and concrete box with soft box.
- Change rules to allow box collar padding to overlap edge of box.

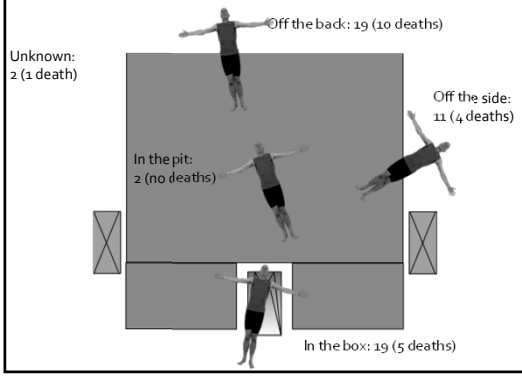


Padding the Box Area

- Establish performance standards for padding

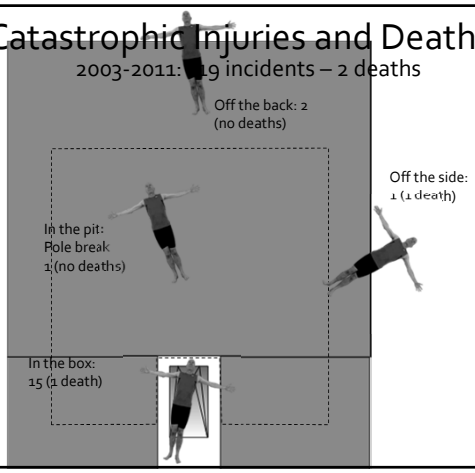
Catastrophic Injuries and Deaths

1971-2002: 53 incidents - 20 deaths



Catastrophic Injuries and Deaths

2003-2011: 19 incidents – 2 deaths



Pole Vault Helmets

- Four states required high school pole vaulters to wear helmets:
  - Maine;
  - Minnesota;
  - North Dakota; and
  - Wisconsin.
- A similar proposal was also presented in New York.

Pole Vault Helmets

- What is a pole vault helmet??

Helmet Standards

- ASTM standard F2400 developed and approved in 2006 for helmets used in pole vaulting

Pole Vault Helmets

- A fall from a typical pole vaulting height of 3 meters or higher onto a hard surface would easily exceed the protection capabilities of a helmet.
- The highest drop test height specified in the ASTM pole vault helmet standard, F2400-06, is only 2 meters.

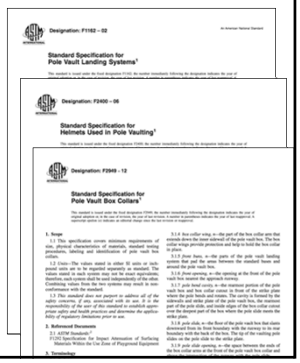
Pole Vault Helmets

- A helmet, however, is not likely to prevent serious injury or death if a vaulter lands outside of the pole vault pit and strikes his or her head after a vault.

ASTM: F2400-06 Standard Specification for Helmets for Pole Vaulting in *ASTM Standards on Disc - Vol. 15.07 - Sports Equipment and Facilities; Pedestrian/WalkwaySafety and Footwear; Amusement Rides and Devices; Snow Skiing*. W. Conshohocken, PA: ASTM International, 2011.

Developing ASTM Standards for Pole Vault Equipment

- ASTM F1162 –Standard Specification for Pole Vault Landing Systems.
- ASTM F2400 – Standard Specification for Helmets Used in Pole Vaulting.
- ASTM F2949 – Standard Specification for Pole Vault Box Collars.


Designation: F1162 – 02

Standard Specification for Pole Vault Landing Systems

Designation: F2400 – 06

Standard Specification for Helmets Used in Pole Vaulting

Designation: F2949 – 12

Standard Specification for Pole Vault Box Collars

Standards Organizations

- The organizations include:
  - ASTM.
  - NOCSAE.
- The specifications and testing standards assist rules makers: NFHS, NCAA, USATF, NFL, NHL, etc.

Sport Governing Bodies

- NCAA required box collars meeting ASTM standard beginning in December 2013.
- NFSHSA required box collars meeting ASTM standard in 2014-15 season.

Sports Sciences

Seito Yamamoto - 5.77

Sean Barber – 6.00

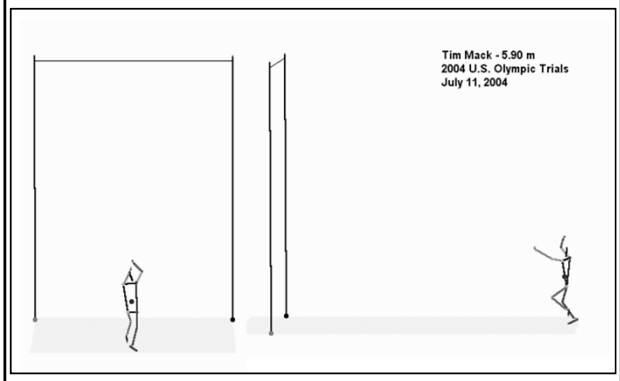
Unusual Camera Locations

3-D Data Collection

- Extend analysis to whole vault.
- Calibrate volume using range poles.
- 3 cameras.

3-D Analyses

- Twist angular momentum
- Alignment at takeoff
- Direction of pole bend
- Bar clearance technique
- …



Why is velocity important?

- TAKEOFF VELOCITY ACCOUNTS FOR ABOUT 60% OF VAULT HEIGHT!

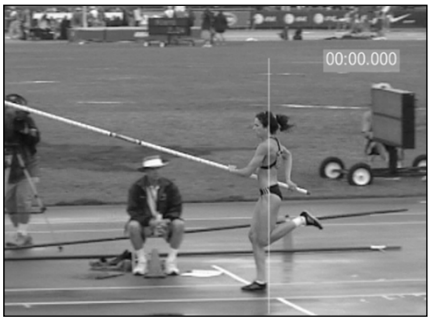
Why is velocity important?

- A fast take off velocity depends on a fast approach run velocity.

How is velocity measured?

- Mark 5 m intervals on runway.
- Record run with high speed video camera (300 fps).

How is velocity measured?



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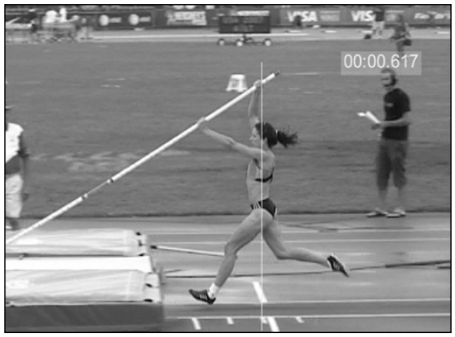
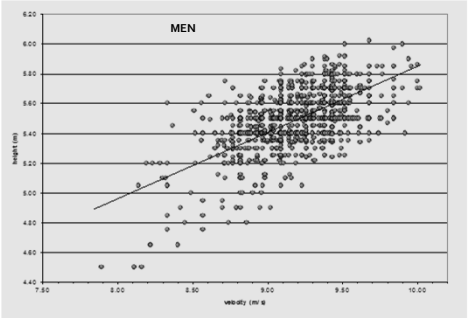


What does it mean?



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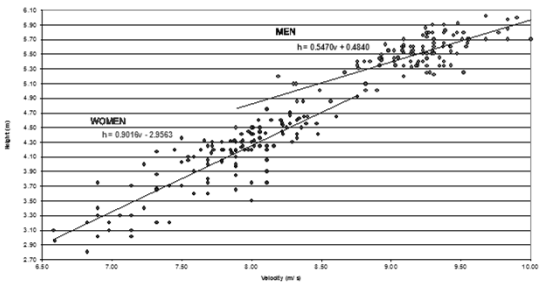

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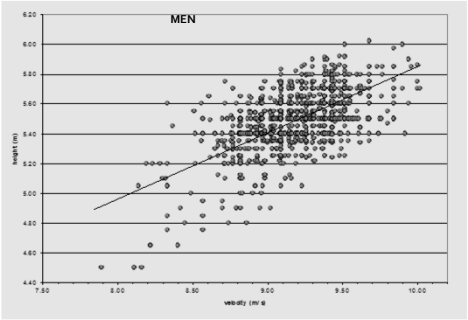


What Can One Do With This Information?

- Predict vault height based on velocity.
- Estimate velocity required for a given height.
- Evaluate technique.
- Examine changes in velocity over the course of a competition.
- Guide training.
- Plan meet strategy (opening height, etc.).

The Fine Print

One must be fast

to vault high.

The Fine Print

But . . .

The Fine Print

Just because you are

fast does not mean

you will vault high.

More Fine Print

- Speed versus accuracy of movement.
  - Increasing velocity may at first lead to technical errors.
  - The fastest velocities recorded for most vaulters were on missed attempts.
- Many repetitions at higher speed are needed before your technique is effective and stable at that speed.

Teaching New Pole Vaulters

Getting to Year Two

You're the New Vault Coach

- You've just been informed.
- You've already changed your pants.
- Now what?

New Vault Program

Challenges

- No experienced vaulters.
- Few poles.
- No access to special equipment.
- No SOP.

How the Vault is Traditionally Taught

1. How to carry the pole.
2. How to run with a pole.
3. How to drop and plant the pole.
4. How to jump up onto the pole at takeoff.
5. How to swing to above the hands.

Maxims of the Vault

2016 PV Summit Staff Meeting

1. The vault is holistic and sequential.
2. The approach run must be rhythmic with good posture. All can't be fast but all can run well.
3. The pole carry and pole drop are the keys to the rest of the vault. The athlete generates pole speed.
4. Don't try to bend the pole. Try to move the pole quickly to vertical.
5. Generate swing speed through effective takeoff dynamics and focus on hip speed.
6. Land safely in the pit or you can't repeat the first five Maxims.

Source: Dr. Jim Bemiller and the 2016 Pole Vault Summit Staff

Progression of Psychomotor Skill

Levels of Skill Competence:

1. Unconscious Incompetence:
   - *Not knowing, not thinking and not able.*
2. Conscious Incompetence:
   - *Knowing, thinking and not able.*
3. Conscious Competence:
   - *Knowing, thinking and able.*
4. Unconscious Competence:
   - *Not thinking and able.*

Source: Rick Baggett

How it Should be Taught

1. How to jump up onto the pole at takeoff.
2. How to drop and plant the pole.
3. How to run with a pole.
4. How to swing to above the hands.

Guiding Principles

- Simple but not easy.
- The goal is to land in the pit.
- Gravity never takes a break.
- A confident athlete is a trusting athlete.
- Teach them correctly now so they can vault high later.
- Kids aren't stupid.
- Kids are stupid.
- If they can't do it slow, they can't do it fast.
- Speed + insecure takeoff = disaster.

Your Goal is to Teach Your Beginner:

- To take off powerfully and balanced.
- To be the windshield, not the bug.
- To land in the center of the pit.
- To control his/her entire body during vault.

Things the Athlete Can Figure Out
(With Some Help)

- Pretty much everything else.
- Don't major in minor stuff.

Value of the Unbending Pole

- Take off technique.
  - Teaches moving, not bending pole.
  - Leads to better swing up mechanics.
- Safety – bending pole is a great multiplier.
- Cost.

The Sand Pit
Low Energy System

- Allows athlete to acclimate to shock of hitting the box.
  - Numerous muscles in shoulder girdle that need to coordinate.
  - Shoulder girdle as shock absorber.
- Allows athlete to concentrate on balance and positioning.
- Allows athlete to develop and understand sensory environment of a good take off in a low danger situation.
- Establishes unconscious competence with respect to landing in the middle of the pit.

Nuts and Bolts

- The sand pit is your friend and most valuable tool.
- Teach bailout technique early.
- For beginners, adjust grip to takeoff point, not vice versa.
- If they cannot do it slow, they cannot do it fast.
- There are very few drills worth practicing.
- No pole bending until they can stiff pole:
  - 11′ (guys); and
  - 8′ (girls).
- The practice bar does not get raised until the athlete proves the clearance was not an accident.

Running with a Pole

- Balance and power are everything.
- The take-off starts at the beginning of the run.
- Proper pole carry:
  - Weak versus strong position.
  - Dropping pole tip.
- Consistent mid-mark step.

Taking Off

- Balance is everything.
- Almost everything geared towards moving pole.
- Tall versus square.
- Top hand high over take-off foot.
- Free take-off overrated and misunderstood.
- Box engaged just as take-off toe leaving ground.
- Elastic, not locked, lower arm.
- Take-off angle about 15-20 degrees, but athlete should make jumping effort.

Good Jumps

- Sound alike.
  - Approach cadence.
  - Tip hitting box.
- Toe leaves ground when tip hits box.
- Uneventful takeoff.
- Takeoff angle roughly 17-19 degrees.
- Swing catches up to cord of pole at right time.
- No passive phase.
- Athlete lands in middle of pit.
- Last about 1.4 seconds.

Coaching Tidbits

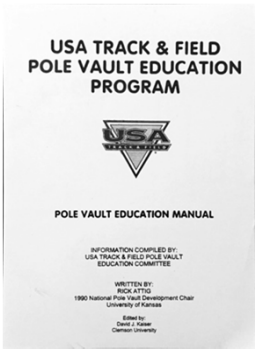
- Rome wasn't built in a three month track season.
- Right pole/right run/right grip.
- If there is less pole to bend, don't bend it so much.
- When watching video, the error usually occurs several frames before you see it in real time.
- Do your coaching when it's time to coach.

The Art of Coaching

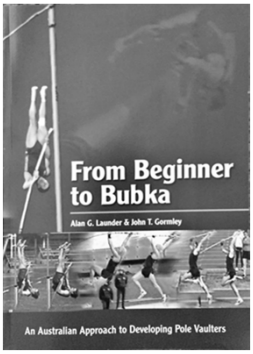
- Do your coaching when it's time to coach.

USATF Pole Vault Education Manual

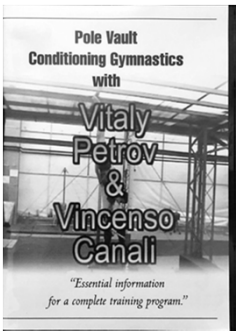
Rick Attig



From Beginner to Bubka
Alan Launder and John Gormly



Pole Vault Conditioning Gymnastics DVD
Vitaly Petrov & Vincenso Canali



David Butler's Mentoring Program

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Thank You for Your Time