Benchmarking Matrix for Height Potential in the Pole Vault

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Pole Vault Editorial Topics

1. Term: **Technique**
   1. Reduce the confusion by talking specifics not vague verbiage.
   2. Sam Kendricks vs Shawncy Barber. Prime example of personal preference do you like gripping or do you like push height!!
   3. Technique encompasses all aspects of the vault: runway velocities, pole speed, swing speed and clearance ability.

2. Pole Vault Gurus
   1. Total development as a coach.
   2. Don’t be afraid of the vault. It’s a false vibe given to make it exclusive.
   3. Giving opinions isn’t coaching it’s called providing distractions.

3. Term: **Safety**
   1. Best interest of our athletes in all circumstances.
   2. All sports are injury risk activities and no one should negatively promote safety for the appearance of personal gain and/or bias/boredom.
Matrix Topic #1: Velocity

• Catch 22
  - Track and Field 101: Velocity is the greatest deciding factor in performance potential.
  - Track and Field 102: Velocity is the greatest damaging factor to technical efficiency.

• Technical development is easier at sub maximal levels.

• Challenge: Maintain technique efficiencies while physically and mentally being able to handle increased velocities.
  - Short approach champs are like practice champs. They still lose!
Matrix Topic #1: Velocity

- Dr. Peter McGinnis velocity to height charts.
  - Based on average velocity: Men 10m to 5m and Woman 9m to 4m.

- Graph developed from hundreds of vaults observed.
  - For X velocity you should expect to see Y performance within the range stated.

- Interpreting the Graph:
  - Below the line: deemed to have poor technical efficiency.
  - Above the line: deemed to have high technical efficiency.
Matrix Topic #1: Velocity

\[ h = 0.55v + 0.47 \]

\[ r = 0.72 \]
Matrix Topic #1: Velocity

\[ h = 0.90v - 2.97 \quad r = 0.87 \]
Matrix Topic #1: Velocity

• Determine your athlete’s velocity: the old school way.
  o Mark off a zone on track/runway that is 1 to 5 meters in length.
  o Use camera with known frame rate ideally 120 frames per second or higher.
  o Using programs like Quick Time 7 to help you count frames easier.

• Time:
  o End frame number minus starting frame number divided by total frames per second equals time to cover distance.

• Velocity:
  o Take distance divided by the time.

• Match the number you get up with the chart!!!
Matrix Topic #1: Velocity

2 Meter Segment
Matrix Topic #1: Velocity

- Data from Video
- Starting Frame: 51
- Ending Frame: 76
- 25 Frames / 120 Frames
- .208s for 2m segment
- 2m /.208 = 9.615 m/s
- Velocity Discovered!
Matrix Topic #1: Velocity

![Graph showing the relationship between velocity and height for men. The equation is $h = 0.55v + 0.47$ with $r = 0.72$.](image-url)
Matrix Topic #2: Acceleration into Takeoff

• **Key:** Maintain postural integrity over last 3 steps:
  - LJ example: Over rotation by stubbing foot at the board.
  - Use of penultimate is debatable in terms of takeoff angle desired!

• **Average Velocity vs. Instantaneous Velocity**
  - Kinetic Energy equation is based off the velocity at the moment of impact and breaking contact with the ground.

• **Executing proper explosion technique vs. simply slamming foot into the ground? (I.E. Get your foot down)**
  - Vector angles greatly affect the pole the athlete can rotate.
  - The mere appearance of quicken up is not the same.
Matrix Topic #2:
Matrix Topic #2: Acceleration into Takeoff

- OptoJump Next by Microgate – data collecting system.

- Elite woman competition at 2016 Akron Pole Vault Convention.
  - Data can be interpreted as desired!!!

- Video or Study review:
  - Attempt to find tendencies in all movements not just moments in time that you are looking for.
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<th>Athlete</th>
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Grip Height vs. Push Height

- Similar to the link between
  - Stride Length and Stride Frequency
  - Improvements in one category could negatively affect the other.

- Easy Math Equation: Don’t make it complicated!!
  - Grip Height + Push Height = Bar Clearance

- Part Art and Part Science
  - Match the skills of the athlete to technique improvements to optimize both grip height and push to achieve maximal success.
  - Style and how it looks doesn’t translate equally to height gains.
Matrix Top #3
Grip Height

• How to figure out an athlete’s grip!
  - Effective grip: Take height of initial grip then subtract 8” for the box depth.

• Ideal Takeoff Spot!
  - Free Takeoff, Under or Pre Jump: Your choice!!!!

• Match effective grip to ideal takeoff spot or
  - Match goal effective grip to set progressions.

  - Can the athlete handle your coaching philosophy?
Matrix Top #3
Grip Height Test

- Perform Stiff Pole drill from 6 or 8 steps
  - # of steps depending on ability to accelerate.
  - Attempt to rotate pole past zero with highest grip.
  - Ability to swing will disappear after athlete holds high enough and technique will become sloppy. As long as hand doesn’t slip it’s a success.

- Correlation:
  - Measure grip to give you an approximation of where athlete could takeoff from explosively and still rotate a pole into the pit.
  - Does technical abilities match effective grip, goals and ideal takeoff spot?
Mary Saxer was able to grip just under 13’.
  - During career took off between 11’9 and 12’2 on 14’7 and 15’1 poles. At 2017 US Nationals she took off from 13’ and finished the jump.

Mark Hollis was able to hold over 14’.
  - 2008 - 2011 took off between 13’ and 13’6, jumping on 5m and 5.10 poles. Later in his career he was able to rotate longer poles.

Videos and information showing Grip Test
Grip Height Test
Grip Height Test
Matrix Top #3: Push Height

- To determine your athletes push height:
  - Take the effective grip and subtract clearance height.

- Push Height is a result of many simple and advanced topics:
  - Swing angular momentum (swing speed)
  - Kinesthetic sense to catch the pole (before it unbends).
  - Vault pole stiffness capabilities to length (flex/weight rating)
  - Many more advanced topics.

- Flex ratings become vital in linking swing to push potential.
  - Flex ratings from one company to another are not uniform.
Matrix Top #3: Push Height to BW

- High School Rule Change – BW labels are needed!!

- Adjustments needed:
  - To males weighing over 190 pounds
  - To soft, regular and stiff flexes with a given weight rating.

- Actual energy acceptance, conservation and energy return of pole vault poles at different lengths, designs and stiffness ratings???
  - Only sales documents saying our poles return energy better than their poles. Until more known it’s a personal preference!!!
Matrix Top #3: Push Height to BW

- Take Body Weight of athlete and compare to Pole Weight Rating.

- Not an exact science, but gives you approximation of the push height range you should expect to see.
  - For presentation I made the ranges wider than I would normally use.

- Adjust chart for your athletes as needed or desired to indicate when it is time to move grip or work pole stiffness.
  - Commonly heard comment that athlete can’t move up till they can jump 13’ on a 13’ pole, it is possible but challenging and limiting!!!

- Connective tissue thoughts for men vs. woman!
# Push Height to Body Weight

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<th>Weight Change</th>
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<tr>
<td>-5 Pounds</td>
<td>1’3” under to 3” over</td>
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<td>+5 Pounds</td>
<td>6” under to 1’ over</td>
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<td>+10 Pounds</td>
<td>Even to 1’3” over</td>
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<tr>
<td>+15 Pounds</td>
<td>3” over to 1’6” over</td>
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<td>+20 Pounds</td>
<td>6” over to 2’ over</td>
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<tr>
<td>+25 Pounds</td>
<td>1’ over to 2’6” over</td>
</tr>
<tr>
<td>+30 Pounds</td>
<td>1’6” over to 3’ over</td>
</tr>
<tr>
<td>+35 Pounds</td>
<td>2’ over to 4’ over</td>
</tr>
</tbody>
</table>

*Height ranges are broader than I use to give the audience a range, you will need to identify the correct ranges for your group.*
The Ultimate PV Dream

- **The 17’ Female!!!!!**
  - Scenario #1: 2’ push with 15’8 grip on 16’1 pole.
  - Scenario #2: 2’6 push with 15’2 grip on 15’6” pole.
  - Scenario #3: 2’10” push with 14’10 grip on 15’1” pole.
  - Scenario #4: 3’3” push with 14’5 grip on 14’7” pole.
  - Good Luck!!!

- **The 21’ Male!!!!!**
  - Scenario #1: 3’6 push with 18’2 grip on 18’6” pole.
  - Scenario #2: 4’ push with 17’8 grip on 18’ pole
  - Scenario #3: 4’6” push with 17’2” grip on 17’6” pole
  - Scenario #3: 5’ push with 16’8 grip on 17’ pole
  - Good Luck!!!
Push Height to BW Examples

- **Mary Saxer: 145 pounds BW – US Indoor Champion**
  - Clearance 4.71 on 4.60 19.9 (160) gripping 4.48 thus 14’ effective grip and 1’5” push @ 15 pounds over BW
  - Clearance 4.71 on 4.45 19.6 (170) gripping 4.37 thus 13’9” effective grip and 1’8” push @ 25 pounds over BW

- **Sandi Morris: 141 pounds BW – World Silver**
  - Clearance 5.00 on 4.45 18.1 (180) gripping 4.42 thus 13’10” effective grip and 2’6” push @ 40 pounds over BW

  - Clearance 5.75 on 5m 12.8 (205) gripping 4.90 thus 15’4” effective grip and 3’6” push @ 25+ pounds over BW (205 range is difficult)

- **Sam Kendricks: 175 pounds BW – World Champ**
  - Clearance 6.00 on 4.90 13.0 (210) gripping 4.85 thus 15’2” effective grip and 5’ push @ 35 pounds over BW...

- **Dani Wojciecowski: 118 pounds BW – NAIA Champ**
  - Clearance 4.05 on 4m 20.8 (145) gripping 3.88 thus 12’0” effective grip and 1’3.5” push @ 25 pounds over BW
Matrix Top #3: Push Height to BW

Suggestions

- **Men**: Push 2’6 – 3’6 is a must have for elite potential. Anything near 4’ or more is a wild goose chase.
  - Aim for 2’6” push then move grip till takeoff abilities are near max.

- **Woman**: Push near 1’ – 2’ is a must have for elite potential. Anything more than 2’ is a wild goose chase.
  - Aim for 1’ push then move grip till takeoff abilities are near max.

- Huge fly aways (pushes) are exciting to watch.

- High consistent clearances win championships.

- Ultimate goal is to maximize push, grip and total technical efficiency at high rates of velocity.
Matrix Top #4: Mental State

- **Clear Mind = Increase chance for optimal performance.**
  - Joking comment: the less they think the better.

- **Pole Vault has an inherently high injury risk activity.**
  - Only the athlete can commit to performance and safety unconditionally.
  - Final 10% of performance is the mental allowance for things to occur. Can’t coach it can only guide them to the promise land!!

- **Is my male or female athlete overweight?**
  - Matrix can help the athlete address the issue personally. Do not tell your athlete they are fat. Zero percent of the time it will help long term!!

- **Mary Saxer: College years!!!!**
  - Are we helping or damaging our athletes?
  - OMSAT (Ottawa Mental Skills Assessment Test-3)
Matrix Top #4: Mental State

- Athlete Centered Model: Coach is Architect!!
  - One clear message on all training and technical development.

- Mind boggling norm observed:
  - Middle level vaulters vs. top level vaulters.

- Pole Vaulters comparison to social media!!
  - Educate your athletes to respect others, but say no thank you to random suggestions.
  - Technique/training is coach driven with athlete’s input and thoughts taken into account. It’s a team effort.
  - Minimize randomness and maximize goal oriented progression.

- Why is communicating with other coaches that difficult?
A few questions

- Heart to heart with elites I’ve worked with and observations I have about my college athletes. Be careful what you ask a young adult.

- Question #1: Are life activities or your job as a pole vaulter/athlete more important?
  - What are they willing to miss in life to be a professional/college athlete.

- Question #2: If breaking the WR and being #1 in the world meant there was a slim chance you could land in the box and never walk again do you go for it unconditionally or do you play it safe?
Matrix Top #4: Mental State

- Understanding their mental state helps goal setting.
  - If not committed 100% it is almost impossible to reach max.
  - The mind will typically hold the athlete back before technique.
    - Mess with the mind and it’s on you COACH!!!

- The quickly changing minds of a 18-23 year old.
  - They are just kids growing into adults not 100% our personal toys.

- Coaches can’t want it more than the athlete, we have to steer them in a direction of excellence.
  - How many athletes did you lose before you found the lonely winner? Measure success by how many didn’t break, not by how many survived.
Final Thought

Athlete’s have one career, are you doing everything in your control to help them now and in the future?

Or are you doing what is best for you, the COACH?

As coaches we sometimes need to check our egos, we are not producing widgets, we need to coach the athlete as needed individually; mentally, technically and physically.
Thank you for attending.

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