

Maximizing the Ring for Tall Throwers: Rotational Shot Put



Common Language

- Double Support
 - Back of the ring until right foot picks up
 - Power position- from left foot touch down until either foot comes off the ground in stand throw
- Single Support
 - Back of the ring from right foot pick up until left foot pick up
 - Middle of ring from right foot touch down until left foot touch down

Common Language

- Flight Phase
 - The time between leaving single support on the left foot in the back of the ring until right foot contact in the middle of the ring.

What the Science Tells Us

- Velocity = Distance over time
- Acceleration = Distance over time Squared
- Maximum Velocity= When the athlete accelerates for the longest amount of time.

- Momentum = Mass x Velocity

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What the Science Tells Us

- Angle of Release
- Height of Release
- Speed of Release

- SPEED OF RELEASE – Critical Factor!!

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Creating Force while Rotating Interpreting the Science

Two Types of Force: Rotational and Linear

- Rotational (mostly through a vertical axis)
 - Acceleration- only produced in double support phase
 - Velocity- maintained in zero, single or double support phases
- Linear (horizontal and vertical)
 - Acceleration- able to be created in single and double support phases
 - Velocity- maintained in zero, single, or double support phases

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Creating Force while Rotating Interpreting the Science

The greatest velocity of shot will be achieved by maximizing rotational forces versus maximizing linear forces.

- Maximizing rotation puts the shot through a longer potential path of acceleration. In such a small ring (7') this is the greatest way to create the longest path of acceleration.
- Rotational technique is successful by creating the greatest amount of rotational momentum (mass x velocity) in the preliminary movements and stand throw, then converting it into *shot put* velocity at release.

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Creating Force while Rotating Interpreting the Science

- To create greater rotational forces in double support phase the athlete must:
 - Create longer double support phase for bigger potential acceleration
 - Be more efficient at creating acceleration in double support phase with out giving up technical positions

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Technical Applications of the Science: **Back of the Ring**

- Create rotational momentum not velocity. This is done by:
 - Using momentum
 - Using a large right leg sweep.

- Toe to Toe Distance



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Technical Applications of the Science: **Back of Ring**

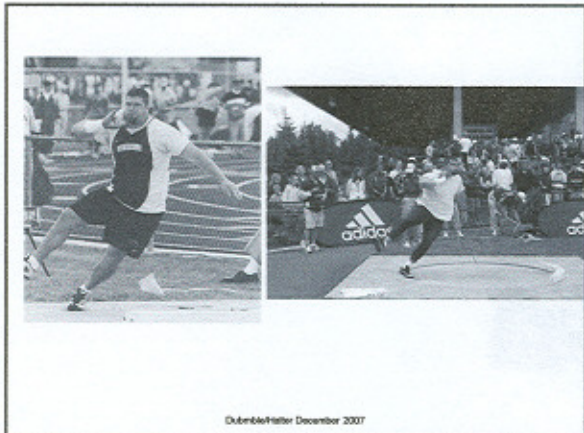
- Right leg must do most of the rotational acceleration.
 - Upper body *cannot* be used to create rotation because it will decrease the possible amount of separation later in the throw.
 - Left leg cannot be the primary source of rotation because it creates a chain reaction that ends in the left leg touch down being late.
 - Therefore, the right leg is the only lever remaining that would be able to create technically efficient rotational force.

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Technical Applications of the Science: **First Single Support**

- Maintain body movement as a unit
 - Critical for maintaining the rotation around a vertical axis
- Keep established left foot pivot point
- Right hip/ leg sweep
 - Biggest toe to toe distance
 - Critical for Maximizing Rotational Forces
- Low sweep sets up lift off left side
 - Allows a lowering of the COM in single support
 - Allows a slight vertical displacement of the COM off the left
- COM drops as the thrower moves through single support

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Technical Applications of the Science: **Single Support in the Back/ Impulse off the Left Leg**

- **Skipping**- timing the sweep of the right leg/hip with the triple extension of the left leg
- **Lift COM off left leg vs. drive**

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Technical Applications of the Science: **Single Support in the Back/ Impulse off the Left Leg**

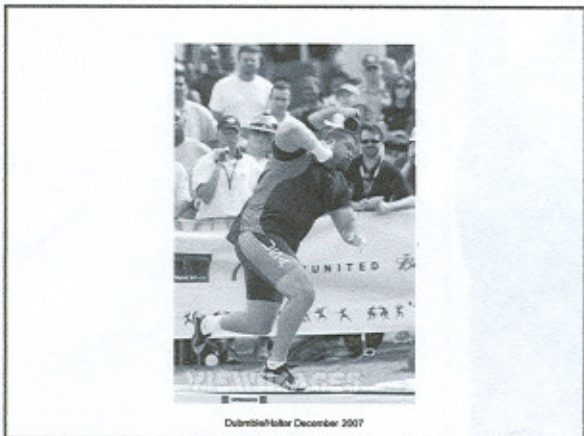
- The mass of the right leg/hip travels through a orbit that puts the high point in the direction of the throw
- Optimal use of the legs allows upper body to remain passive and separated

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Technical Applications of the Science: **Flight Phase**

- **Create Early Separation!!!**
 - Facing the throw position with Chest
 - Hip leading
 - Pre-stretch position with shoulders separated
- **Vertical displacement of COM**
- **Let the ground come to you**
 - Knee up- Toe up
 - Eccentric loading in the middle

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Technical Applications of the Science: **Momentum in Middle**

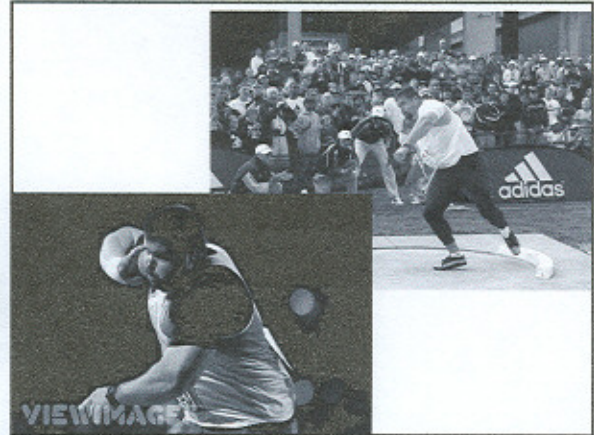
- **Keep axis of rotation on right leg as tight as possible**
 - Pivoting with the majority of body weight on a right foot axis helps maintain rotational forces through the stand throw.
- **Converting momentum**
 - Rotational momentum is converted from the wide right leg (long lever) by establishing an axis on the right leg in the middle and tucking the left leg (shortening the lever radius) into its proper position in the front.

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Technical Applications of the Science:
Front of Ring

- Create longest potential path with the shot in double support phase
 - Optimal vs. Maximal shoulder- hip separation
 - Left foot touch down with longest optimal path of shot
 - Keep COM over right foot axis to increase time in double support phase

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Technical Applications of the Science:
Front of Ring

- Left leg used for block
 - Creates lift
 - Creates more rotational acceleration
 - Helps keep COM over the axis of rotation
- Right leg used for pure rotational acceleration
 - Maintain if not create more rotational velocity by keeping it constantly moving ahead of the shoulders
 - Rotation of the knee and foot completes when facing towards the middle of the sector

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Transferring Momentum of Athlete/Shot System into Velocity of Shot

Optimal throw must transfer all momentum perfectly at the time of release.

- Block of left side helps transfer rotational momentum into linear velocity (Vertical).
- Time vertical extension of legs with completion of rotation of hips towards the direction of the throw.
- Horizontal (arm) will be last application of force.

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Technical Applications of the Science:
Front of Ring

- Note: When the middle to the front of the ring is properly executed, rarely will the right leg achieve triple extension.
 - Obviously there is a tremendous amount of vertical force from the right leg however, rotational energy is so fast at this point of the throw, the thrower simply does not have time to achieve triple extension.

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