SHOT PUT

Technique and strength are two essential factors in optimizing performance in the shot put, although, opinions vary as to which is more important. Coaches must evaluate each athlete, then emphasize the area of deficiency. Many shot putters have sufficient strength to achieve outstanding marks, but, due to inefficient throwing mechanics, are incapable of maximizing force to the shot.

The parameters which determine throwing distance are: (1) release velocity, (2) angle of release, and (3) height of release. Release velocity, the most significant of these, is governed by linear and rotational acceleration of the shot resulting from the transfer and summation of forces. These acceleration are initiated by the powerful muscles of the legs, hips, and trunk and concluded with the muscles of the upper extremities. The transfer of force is accomplished by abruptly stopping (blocking) the momentum of a particular body segment which transfers and adds to the force of the next segment (e.g. the legs, hips, trunk, shoulders and arms form a sequential "link system" in throwing events). The angle of release should be between forty and forty-one degrees from horizontal, and the height of release will vary depending on the athlete's physique and technical proficiency. Remember, the trajectory of the shot is a direct result of the thrower's technique (force application).

Manipulating these variables at release will effect performance. However, coaches and athletes should avoid focusing exclusively on the release at the neglect of movements which precede it. If preparatory movements are inefficient, they will adversely affect the release and throwing distance. Although segmented here for explanation, the throw should be considered one movement, emphasizing a continuous rotational and linear acceleration of the shot. Delivery begins at the **back** of the circle with the thrower anticipating each movement and position to eliminate hesitations and maintain continuity. Keeping these factors in mind, we can now identify the movements and positions contributing to a good throw. Both the traditional (glide) and rotational styles of throwing are examined and all explanations are for a right-handed thrower.

TRADITIONAL (GLIDE) TECHNIQUE

GRIP AND NECK PLACEMENT

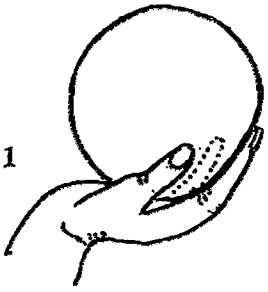


Fig. 1

With the fingers extended and spread slightly apart, the shot is rested at the base of the fingers. The thumb and little finger are a little wider to help stabilize the shot, but should **not** be wrapped around in a gripping fashion (Fig. 1). The shot will naturally roll off the fingers during delivery and release. Keeping the elbow away from the trunk, the shot is placed against the musculature of the neck beneath the back portion of the jaw and kept in place with a slight inward pressure (Fig. 2). Placement may vary slightly to establish comfort and control.

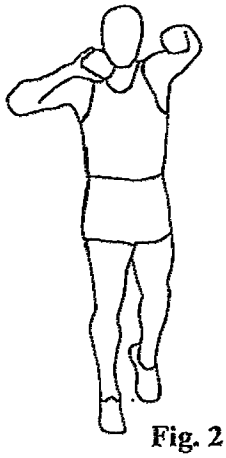


Fig. 2

PREPARATION

A comfortable position is assumed with weight distributed primarily on the ball of the right foot which is placed at the center/back of the circle and pointed 180 degrees from the throwing direction (Fig. 2). The left leg is extended backward with the toe lightly touching the circle. Maintaining balance and stability, the

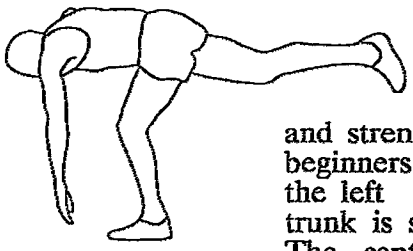


Fig. 3a

athlete shifts to the "T position" by simultaneously flexing at the hip and lifting the extended left leg (Fig. 3a). A lack of balance and strength may make it necessary for beginners to use a "modified T" where the left leg is kept lower and the trunk is slightly more upright (Fig. 3b). The center of gravity is lowered by continued hip flexion coupled with flexion of the knee and ankle of the right (support) leg. The left leg, which was initially extended backward to maintain balance, is flexed at the hip and knee in coordination with the lowering center of gravity (Fig. 4). The left arm, which may be used for balance, is extended forward and remains approximately perpendicular to the trunk throughout preparation. An alternate starting position provides more stability in the back of the ring. Rather than allowing the left leg to swing freely, it is kept stationary by placing the ball of the left foot on the throwing surface (Fig. 5). The feet are commonly four to eight inches apart with the left toe from six to twelve inches behind the right heel. These distances may be individually adjusted to enhance comfort and performance. As the center of gravity is lowered in preparation for the glide, **both** hips, knees, and ankles are flexed simultaneously. Weight is **still** primarily distributed on the right foot.

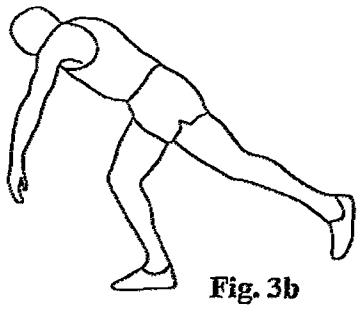


Fig. 3b

Points of Emphasis

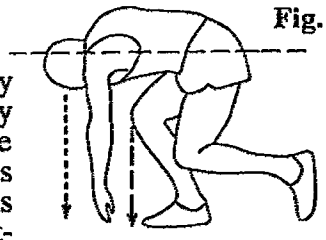


Fig. 4

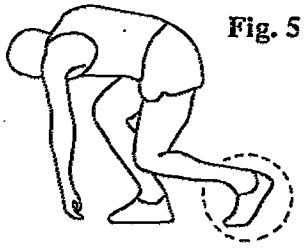


Fig. 5

1. The back remains relatively flat and is approximately parallel to the ground as the preparation phase is completed. The left arm is relaxed, extended, and pointing downward (Fig. 4). Effectively starting from a lower position requires greater strength, therefore, beginners should go only as deep as strength will allow.
2. Do not hesitate at the body's lowest position. It is more difficult to intiate movement from a static position.
3. Although weight is distributed on the ball of the right foot, the entire surface of the foot is in contact for greater stability.
4. The head and neck are in alignment with the trunk throughout, and the line of sight just prior to the glide is straight down (Fig. 4).
5. Keep the right knee *beyond* the right toe to prevent premature unseating (falling backward) (Fig. 4).
6. The shot is kept behind and to the right of the right foot (Fig. 6).
7. Do not rush the preparation phase. Utilize patience and relaxation to maintain balance and control.

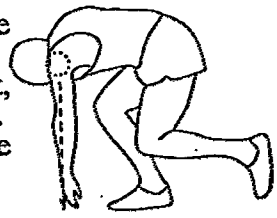
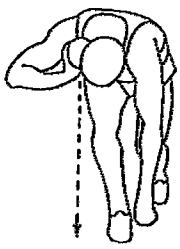


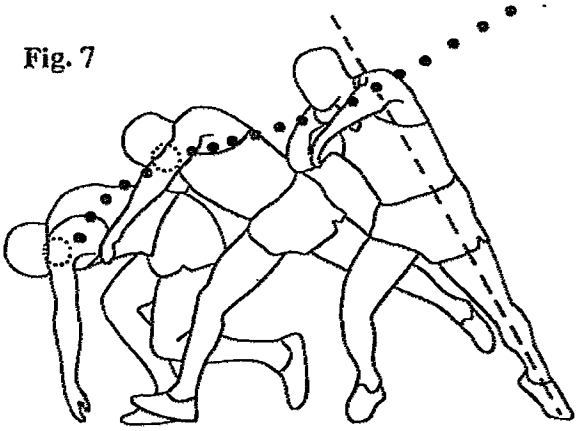
Fig. 6

GLIDE (EXTENSION AND RECOVERY)



Following preparation, the center of gravity is simultaneously raised and displaced in the direction of the throw. The purpose of the glide is to provide maximum **functional** speed for the delivery. Most technical errors in shot putting stem from incorrectly initiating the glide by overemphasizing horizontal drive and velocity across the circle. The increase in velocity to the center of the circle is insignificant compared to the adverse effect on release parameters (height, angle, and velocity).

Fig. 7



Movement is initiated by extending the left leg at the knee and hip toward the toe board. Simultaneously, the right leg and hip provide a vertical/horizontal *impulse* through the ball of the foot. The trunk is rotated toward an upright position while avoiding excessive rise in the center of gravity (Fig. 7). When double support is reestablished a straight line should pass through the joints on the left side of the body (Fig. 7). Congruent with this extension is a counter-clockwise rotation of the hips. The rotational advancement of the hips ahead of the shoulder plane places the large rotator muscles of the trunk on stretch permitting a more forceful contraction during delivery.

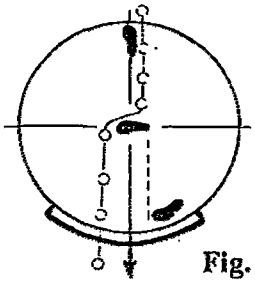


Fig. 8

Immediately following extension, the thrower quickly recovers and rotates the right leg and foot 90⁰ to the throwing direction. The left foot contacts the circle **slightly** after the right foot and the toe is approximately aligned with the right heel (Fig. 8). Placement will be on the ball of the foot, under the body, and near the center of the circle with the shot remaining behind the right foot (Fig. 9). This alignment enhances accelerated hip rotation for a quicker strike at delivery. With a well-executed glide, the shot starts an upward trajectory which continues through delivery (Fig. 7).

Points of Emphasis

1. The right leg is dominant and provides the majority of the gliding force. Emphasizing a quicker impulse from the right leg will greatly assist recovery.
2. Keep the left toe close to the throwing surface during left leg extension and ground the foot as quickly as possible.
3. Although force is generated through the ball of the right foot, throwers will commonly leave the back of the circle from the heel (Fig. 7). Do not drag the right foot during recovery, rather pick it up by lifting the knee.
4. The left arm is extended and swings laterally during extension (glide). The left shoulder will elevate and be higher than the right shoulder at the start of delivery (Fig. 9). Do **not** keep the left arm pointing toward the back of the circle as this restricts the opening of the hips and results in a slower delivery.
5. Rotating the right leg and foot 90⁰ to the throwing direction during recovery contributes to a faster, more complete hip strike and greater release velocity.
6. Both heels are off the ground with weight distibution primarily on the right leg when double support is re-established.
7. Land softly. Both legs are flexed and exerting forces to provide rotation and lift.
8. Anticipating the delivery at contact provides an **active** landing for quicker, more effective force application.

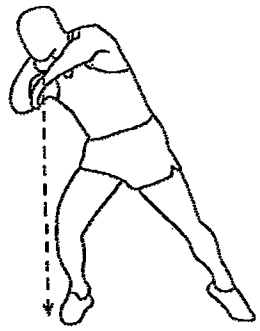
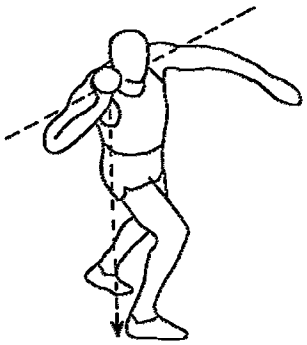


Fig. 9



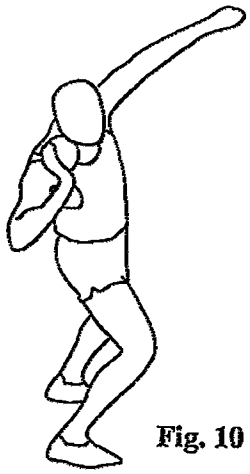


Fig. 10

DELIVERY (RELEASE AND FOLLOW-THROUGH)

Rotation and lift provided by the lower body begin the delivery phase. As weight shifts from right to left, **both** feet and knees pivot toward the throwing direction, and hip rotation which was started in the glide is accelerated. The right leg performs two pushes, one to initiate movement at the start and a second, which, coordinated with the left leg, provides rotation and lift for delivery. The left arm is extended and continues to swing outward and upward until it nears the direction of release (Fig. 10). At this time the elbow flexes and is brought back toward the body assisting the rotational acceleration of the shoulder plane (Fig. 11). The left leg is forcefully extended (commonly called posting) and the previously mentioned deceleration sequence is initiated. Through this sequential deceleration of body segments, force is transferred much like cracking a whip, where the handle's rapid acceleration is suddenly stopped, transferring the force throughout the length of the whip, terminating with a "crack" at the tip. Continuing with the elbow away from the trunk, the forceful extension of the right arm and inside-out motion of the wrist (palm facing out) complete delivery.

Continued rotation throughout delivery produces a strong follow-through and, frequently, the need to switch feet (reverse) to maintain balance. The thrower moves from double support at the start of delivery to a right legged single support following the reverse. With the right foot pointing approximately 90^0 to the left of the throwing direction, the thrower slows the body's rotation by restricting the right foot pivot and extending the left leg away from the rotational axis (Fig. 12). Ultimately, double support is re-established to maximize stability. The reverse is merely a result of the body's strong rotational momentum. Reversing prematurely is a common error experienced by beginning throwers and dramatically reduces release velocity.

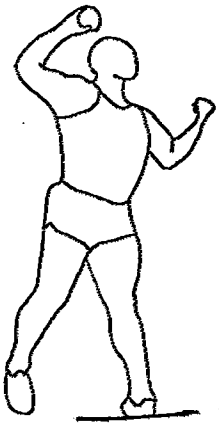


Fig. 11

Points of Emphasis

1. Summate forces from the ground upward. Do not rush the release before the large muscles of the legs, hips, and trunk have contributed.
2. The downward/forward blocking of the left leg not only contributes lift and prevents fouling, but also provides linear acceleration to the upper body and shot. Similarly, the blocking of the left arm and shoulder will rotationally accelerate the right shoulder and shot.
3. Rotational and linear accelerations begin at the back of the circle and continue throughout the throw. **Emphasis should be placed on the rotational aspect of delivery.**
4. Extend beyond the toe board (without fouling) to maximize force on the shot and improve the release point.
5. Do not watch the shot after release. Since rotation continues following release (follow-through and reverse), obtain a focal point behind the circle to help maintain balance.
6. **Avoid fouling in practice.** Throwers should practice "saving" throws during training!

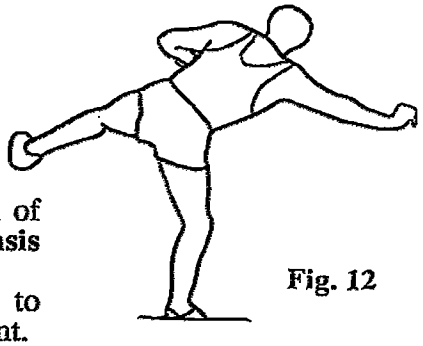


Fig. 12

ROTATIONAL (SPIN) TECHNIQUE

In an event where size and strength usually dominate, it is commonly held that utilizing the rotational (spin) technique may permit a smaller/weaker athlete to be competitive. Incorporating agility, speed, and a longer path of acceleration (Fig. 13), the spinner is capable of generating greater release velocities.

GRIP AND NECK PLACEMENT

The shot is held as in the glide technique, however, some throwers prefer placement slightly further back on the neck. Keeping the elbow away from the trunk positions the thrower's arm to apply inward pressure which prevents premature displacement resulting from the large centrifugal force developed during the spin.

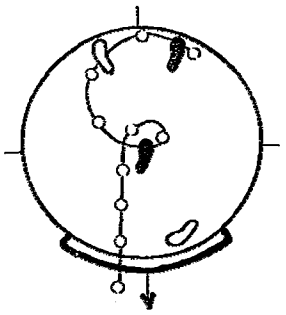


Fig. 13

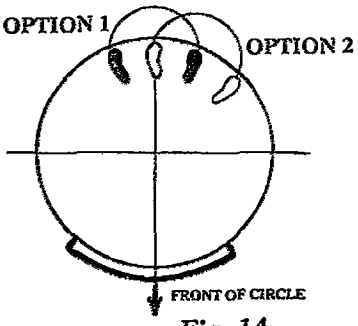


Fig. 14

PREPARATION (DOUBLE SUPPORT PHASE)

The feet are placed a little wider than shoulder width and straddle the centerpoint at the back of the circle. An alternative stance places the left foot at the centerpoint with similar foot spacing (Fig. 14) Arguments for moving to the right claim a longer path of acceleration for the shot. While this may be true, other factors may be negatively affected resulting in a poorer performance. Each thrower and coach can determine which position (or somewhere between) is most effective. Keeping the center of gravity between the feet, the thrower performs a preliminary trunk rotation similar to discus throwing. To maintain balance and control, this **moderately** performed preparatory movement is usually limited to one rotation (clockwise from left to right). The slightly flexed knees remain separated and the left arm is extended and aligned with the shoulder plane throughout.

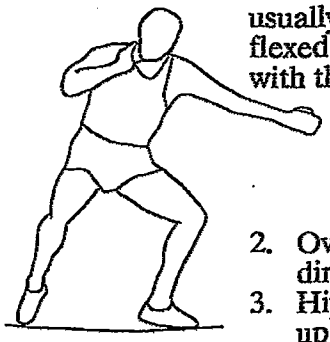


Fig. 15

Points of Emphasis

1. Preparatory movements are relaxed, rhythmic, and never hurried.
2. Over-rotation often creates balance problems and difficulty coordinating upper and lower body movement patterns.
3. Hips and knees are kept flexed to the degree seen at the start. Avoid up and down movements during preparation.
4. The left arm remains in alignment with the shoulder plane throughout preparation and the early stages of the start.

START

During the transition from double to single support, body weight is shifted toward the left. The left toe, knee, and arm are rotated outward while the flexed right knee advances forward bringing the right foot up on the toe (Fig. 15). Keeping the knees apart, the right leg swings wide at the back of the circle while the left upper and lower body **rotate as a unit** (Fig. 16). Throwers commonly rush the start by sitting back before lateral weight shift or by pulling the left arm and/or shoulder toward the center of the ring prematurely. While this gives the sensation of accelerated movement, the upper body must hesitate in the center of the circle to allow the lower

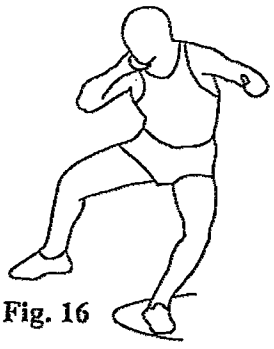


Fig. 16

extremities to *catch up*. Displacement of the center of gravity across the circle occurs at the hip, not the shoulder. The trunk remains relatively upright throughout the throw, while lean initiating linear movement occurs from ankle to hip (Fig. 16). As the side of the left hip "faces" the throwing direction, the left leg provides a horizontal *impulse* which, coupled with the quick strike of the right arch and inner thigh (Fig. 17), propels the thrower into the non-support phase. The right leg strike incorporates an adducting movement (toward the body's vertical mid-line) which enables continued rotation while airborn. Staying on the left foot too long (over-rotation) misdirects the body's linear movement and inhibits rotation while airborn and at delivery. Attempting to move down an imaginary line extending from the left heel toward the front of the circle (Fig. 14) helps prevent over-rotation. Because of strong rotational forces, right foot placement will still be near the center of the ring.

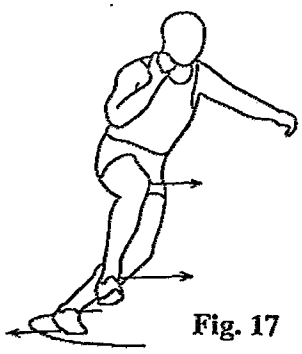


Fig. 17

Near conclusion of the single support phase the long levers of the body are shortened. The right leg flexes slightly at the hip and approximately 90^0 at the knee while the left arm is flexed at the elbow and brought closer to the body. These movements contribute to continued rotation during the non-support (airborn) phase.

Points of Emphasis

1. To ensure movement toward the left side, the left knee is pushed over the left toe as they both rotate outward (Fig. 15).
2. The knees are kept apart. Do **NOT** pivot the right foot and knee at the start.
3. Rotate the upper and lower body as a unit. Rushing the left arm and shoulder ahead of the left leg will result in a mechanical breakdown at delivery.
4. Initiate linear movement by "sitting" away from the left leg while continuing to sweep the right leg. Attempt to lead with the left side of the body (hip) down an imaginary line extended from the left heel.
5. Keep the right elbow elevated to control the shot and better apply force at delivery.
6. Get off the left foot quickly (*impulse*) while simultaneously shortening the body's extended levers. A lengthy, driving extension utilizes too much of the circle and limits rotational acceleration.
7. Actively adduct the right leg to perpetuate rotation in the non-support phase.

NON-SUPPORT PHASE (AIRBORN)

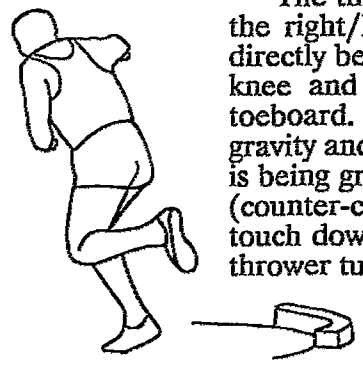


Fig. 18

The thrower continues to rotate around the vertical axis as a result of the right/left leg impulse in single support. The right foot is aligned directly beneath the right knee. Once airborn, the left leg is flexed at the knee and extended at the hip to quickly position the foot near the toeboard. The right foot actively contacts the circle beneath the center of gravity and is pointing between 12 and 1 o'clock (Fig. 18). As the left foot is being grounded, the right foot, knee, and hip continue to rotate inward (counter-clockwise). Body weight rests primarily on the right side at touch down, but shifts immediately toward the throwing direction as the thrower turns into the release.

Points of Emphasis

1. Shorten levers (left arm and right leg) at impulse to facilitate rotation while airborn.
2. Recover and ground the left foot quickly. A forceful delivery initiated by the lower body cannot begin until support from the left leg is provided.

DELIVERY

The trunk remains relatively upright to maintain an effective axis for rotation. The delivery stance is narrower than in traditional shot putting which allows the thrower greater freedom to lift and rotate with **both** legs. When double support is re-established, both knees should be flexed and turning counter-clockwise. The left arm is again extended and swings laterally and upward toward the throwing direction in conjunction with the pivoting right leg (Fig. 19). As the left arm and lower extremities advance, the shot and right shoulder are kept back, placing the muscles rotating the trunk on stretch for a powerful uncoiling of the body at delivery. As weight is shifted toward the left side, the thrower lifts vertically with **both** legs while rotation continues throughout delivery (Fig. 20). Due to great centrifugal force, the shot is kept in the neck a little longer to maintain control and maximize acceleration. At release, powerful vertical lift will cause both feet to be off the ground. Following the reverse, a flat-footed landing and more horizontally extended levers assist rotational deceleration and balance (Fig. 21).

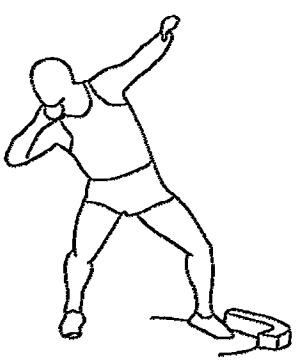


Fig. 19

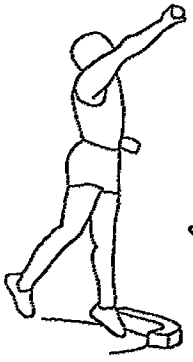


Fig. 20

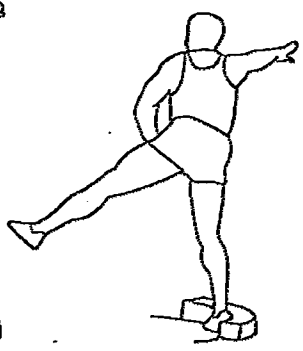


Fig. 21

Points of Emphasis

1. Turn and lift vertically with **both** legs.
2. Rotate the hips ahead of the shoulders to promote a stretch reflex in the muscles that rotate the trunk. This will produce a more explosive delivery.
3. **Avoid fouling in practice.** Throwers should practice "saving" throws during training.
4. Do not watch the shot after release. Since rotation continues following the release (follow-through and reverse), obtaining a focal point behind the circle will help maintain balance.

Again, it should be emphasized that, while segmented for analysis, the various phases of a throw are linked together in a continuously accelerated sequence. Anticipating each phase reduces hesitations or breaks which decelerate the shot and inhibit performance.