POLE VAULT

For simplified analysis, technical factors have been categorized into six phases, but should be viewed as a continuous sequence of movements. The success of each phase is predicated on the successful execution of those preceding. Overall success is limited by the weakest link in this chain of movements, and **most** importantly, the run-plant-takeoff sequence. The pole vault is often considered extremely difficult to master, and while success requires reasonable athletic ability, the most limiting factor vaulters experience is fear or lack of confidence. The following technical information and coaching hints will hopefully serve as a guideline for development of efficient technique and instill confidence in the vaulter.

Pole vaulting is a dual pendular movement which transfers approach speed to: 1) pole rotation 2) vaulter rotation and, 3) elastic energy stored in the pole. The term "pole speed" refers to the velocity at which the pole rotates to vertical and is enhanced by a well directed jump at takeoff. A long body axis and firm left arm initially slow vaulter rotation, which also contributes to the rotational velocity of the pole. **Generating pole speed is the primary objective of vaulters at all levels and is the major factor determining pole size and grip height.**

The vault will be analyzed through its component parts: 1) approach (run up) 2) pole plant 3) takeoff 4) swing 5) inversion and extension and, 6) bar clearance. All explanations are for a **right-handed** vaulter.

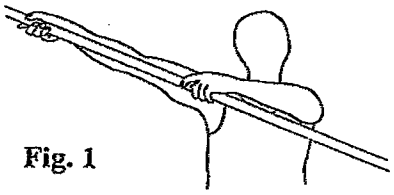


Fig. 1

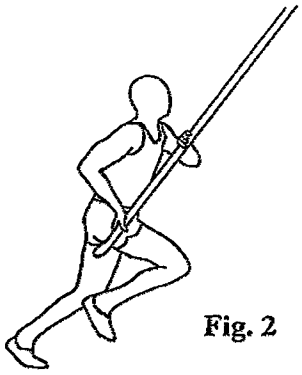


Fig. 2

APPROACH (RUN-UP)

Grip on the pole should be relaxed and comfortable, while tape with chalk (magnesium) or spray adhesive is commonly used to minimize slippage. Allowing for slight individual variation, hand spacing is commonly determined by gripping the pole with the top hand (underhand grip), extending and aligning the right arm with the pole, and placing the bottom hand on the pole (overhand grip) at a point even with the right arm pit (Fig. 1). The pole is carried with the tip high (above 45^0) and <u>slightly</u> across the body. Both elbows are bent approximately 90^0 with the left hand slightly higher than the left elbow and the right hand close to the hip (Fig. 2). Pole movement (front/back or side/side) should be minimized while emphasizing relaxed control of the entire upper body. Since approach velocity strongly influences pole speed, it is necessary to generate maximum controllable speed during the run-up. The effectiveness of this velocity is dependent upon a consistent approach enabling the vaulter to contact the optimal takeoff point (directly beneath the top hand) with no variance in stride pattern or loss in speed. This is accomplished by uniformly increasing velocity throughout a rhythmic, well-coordinated run-up. Maintain an erect and square posture while emphasizing active leg turnover, high knee lift and running on the balls of the feet. Approach length is determined by strength, running mechanics, and experience. While more experienced jumpers commonly run from 18 to 22 strides, it is recommended that young vaulters use from 12 to 16 strides. After a consistent approach is developed (one which continually hits the optimal takeoff point with no variance in stride pattern), a coach's check mark should be established four to six strides from takeoff (Fig. 3). Four strides may be used for shorter and six strides for longer approaches. The athlete does not make visual reference to this mark, it is strictly for the coach to check acceleration and stride consistency <u>before</u> the vaulter perceives the box and makes adjustments. Athletes may utilize a check mark 4 - 6 strides from the start of the approach to govern acceleration.

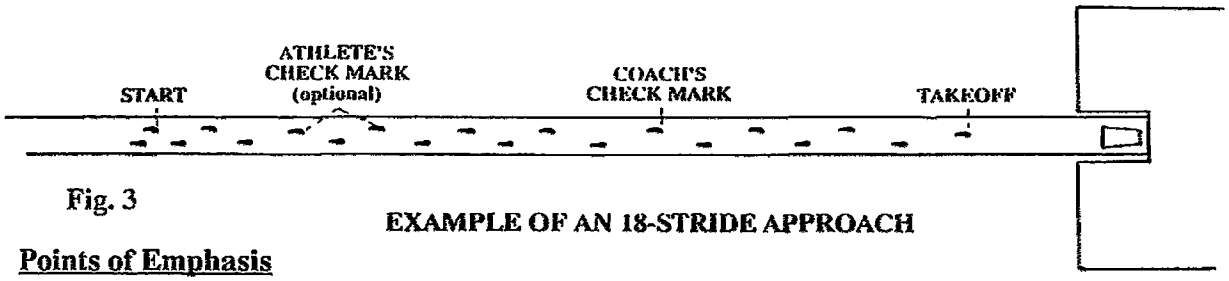


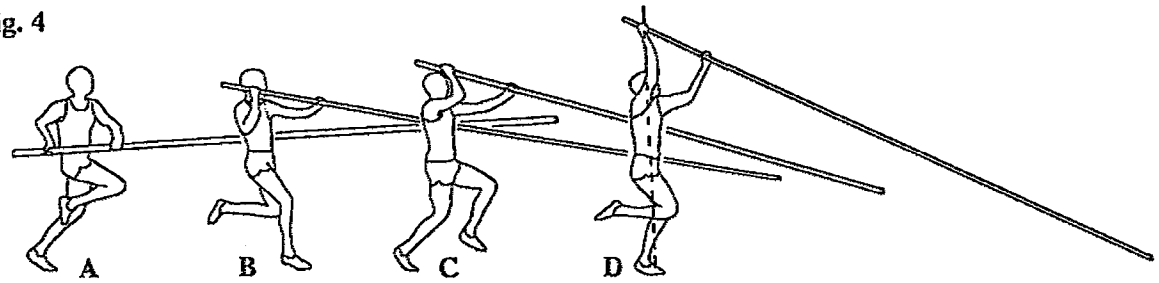
Fig. 3

EXAMPLE OF AN 18-STRIDE APPROACH

Points of Emphasis

1. Pole carry is relaxed and relatively upright (above 45^0). This pole carry is maintained until approximately six strides from takeoff when the pole tip smoothly descends to slightly above head height.
2. Elbows are bent approximately 90^0 with the right hand at the hip and the left hand slightly above the left elbow.
3. Do **not** *pump* the pole front to back or side to side.
4. Select an approach length that allows smooth development of maximum speed **without** sacrificing control.
5. Minimize trunk/shoulder rotation during the approach.
6. Maintain an erect posture with a rhythmic stride pattern and active knee lift.

Fig. 4



POLE PLANT

An effective pole plant enables the vaulter to transfer approach velocity to the pole (pole speed). It is vitally important to continue to sprint in a tall, upright posture throughout the plant to minimize speed reduction during the final strides. To a large extent, a successful plant is dependent upon a good approach and pole carry in which the pole tip is slowly lowered to a point just above head height two strides from takeoff. At this time the pole tip is *allowed to fall* into the box while the arms move the top end of the pole upward and slightly forward (Fig. 4A - D). This is accomplished by lifting the back of the left hand while flexing the right arm at the elbow and bringing the right hand to the side of the face (Fig. 4A - B). Both arms then extend upward and slightly forward (Fig. 4B - D). The pole rotates around an imaginary axis located between the top hand and pole tip, similar to a teeter-totter (Fig. 5). Both arms are kept relatively close to the body as the plant moves smoothly and continuously. The penultimate stride (right foot) is placed flat to prepare the vaulter for a strong vertical impulse at takeoff. As the plant extends overhead the vaulter redirects his line of sight upward. The plant reaches full extension approximately half way through the final stride. An erect posture and fully extended right arm increase the angle between pole and runway and shorten the distance the pole must rotate to vertical.

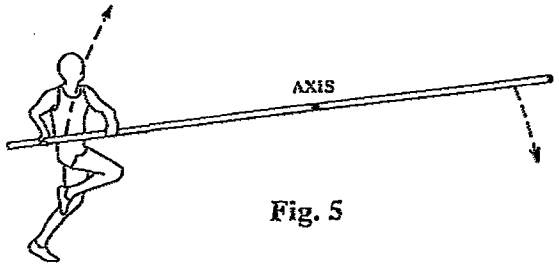


Fig. 5

Points of Emphasis

1. Initiate the plant two strides from takeoff with the pole tip slightly above head height.
2. Remain tall and continue to sprint throughout.
3. Keeping both arms relatively close to the body, move the plant quickly and continuously so the right hand finishes well above and **slightly** in front of the head.
4. Redirect the line of sight upward during the final stride.

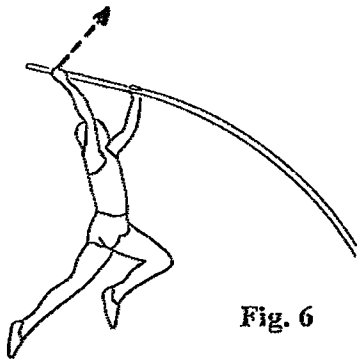


Fig. 6

TAKEOFF

During takeoff, the vaulter attempts to conserve and redirect body momentum (velocity). As the pole tip strikes the back of the box, it stops and acts as a fulcrum, rotating the pole forward and upward. The rate of rotation is referred to as "pole speed" and strongly influences the success of the vault. The takeoff is a **jump** and is simultaneous with the pole tip's contact with the back of the box. The redirection of approach velocity is enhanced by a tall, upright posture and a quick/forceful leg exchange (punt step) during the final stride. The complete and forceful takeoff leg extension resulting from the jumping movement provides a desirable **vertical** impulse. Placing the takeoff foot directly beneath the top hand optimizes pole angle relative to the ground and shortens the pole's rotational distance to vertical. This placement also positions the vaulter for a stronger vertical impulse (Fig. 4D). When the pole tip strikes the back of the box, the left arm remains firm and takeoff force is directed through the hand of a fully extended right arm. **The left arm does not bend the pole.** Excessive force applied with the bottom arm is commonly the result of an inefficient approach, plant, and/or takeoff. Vaulter rotation begins as the horizontal velocity of the top hand decelerates.

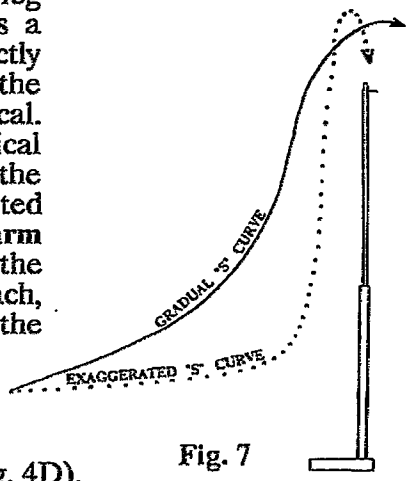


Fig. 7

Points of Emphasis

1. Align the takeoff foot directly beneath the top hand (Fig. 4D).
2. **Jump** to provide a strong vertical impulse and enhance pole speed. Due to approach velocity, the takeoff stride must be anticipated so the thrust of the drive (right) knee is more complete as the left foot contacts the runway (punt step).
3. Initial emphasis is on vertical rise and pole speed - **NOT ON SWINGING** (Fig. 6).
4. An extended right arm and firm shoulder facilitate momentum transfer to the pole.
5. Complete extension of the right arm and left leg increases pole angle and establishes a long axis to slow initial body rotation.
6. It is sometimes helpful for the vaulter to imagine going over the bar head first to better align the body and direct force at takeoff.
7. A strong, well-directed vertical impulse at takeoff produces a gradual "S" curve, where overemphasis of horizontal drive or a premature swing results in an exaggerated "S" curve. The exaggerated curve produces a vault where the athlete characteristically achieves great vertical height, but *stalls* and comes down on the bar (Fig. 7).

SWING

The fundamentals of the swing are similar to the use of the metronome in music. As the weight (mass) of the metronome is distributed farther from the base (rotational axis), rotational speed of the level is decreased. Conversely, as the weight slides closer to the

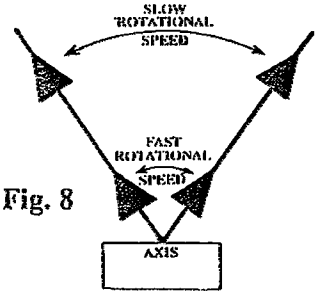


Fig. 8

rotational axis of the lever, the speed (tempo) is accelerated (Fig. 8). The dual pendular movement of the pole vault incorporates two simultaneous rotations immediately following takeoff: 1) The pole rotates around an axis through its tip when it contacts the back of the box and, 2) Vaulter rotation is from the top hand initially, but later shifts to an axis through the shoulder plane (Fig. 9). Following an active jump at takeoff which propels the vaulter's center of gravity upward, a long body axis is created by keeping the arms and left (take off) leg extended. This accomplishes two objectives: 1) enhanced pole speed resulting from lower mass distribution relative to axis #1; and, 2) slower rotational speed of the vaulter due to mass distribution (vaulter center of gravity) relative to axis #2 (Fig. 9). Vaulter rotation is initially from the top hand, however, the rotational axis shifts to the shoulders as their horizontal velocity slows (Fig. 10). The left (bottom) arm bends slightly at takeoff but extends naturally as the pole bends.

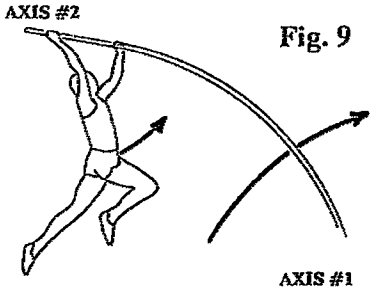


Fig. 9

Points of Emphasis

1. Attempt to direct takeoff forces vertically *through the head.* Anticipating the swing while still on the ground results in misdirected force, premature vaulter rotation, and significantly reduced pole speed.
2. **DO NOT THROW THE HEAD BACK AT ANY TIME.** The head remains normally aligned with the trunk throughout the swing.
3. Keep the center of gravity away from the top hand while moving forward and **upward.** A long body axis slows vaulter rotation and enhances pole speed.

INVERSION AND EXTENSION

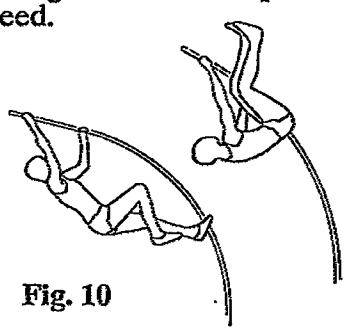


Fig. 10

Flexion at the trunk and hips *(curling the hips upward)* shortens the body axis and enhances rotation to an inverted position (Fig. 10). Flexion of the left (bottom) arm permits accelerated vaulter rotation. There is a simultaneous shifting of body segments (around the center of gravity) as legs and hips rotate upward and shoulders downward. In the inverted position the vaulter attempts to *stay close to the pole* while keeping the legs together (Fig. 11). During extension, the head is rotated in the direction of the turn (left) and the right leg crosses over the left as the vaulter begins a 180^0 counter-clockwise rotation around the inverted vertical axis. If sufficient pole speed is acquired at takeoff, the extension phase should be performed **in front of the cross bar.** Prematurely *dropping the feet* will significantly reduce pole speed and the center of gravity's vertical rise.

Points of Emphasis

1. Do **NOT** throw the head back to invert the body.
2. Flexing at the hips shortens the body's long axis and accelerates the swing to inversion (Fig. 10).
3. Flex the left (bottom) arm to permit full inversion.
4. Stay close to the pole with the feet together during extension.
5. Pull and push directly down the pole.

BAR CLEARANCE

With the bottom hand releasing first, the top hand and arm continue to follow through and extend down the shaft of the pole. The vaulter should *stay hollow* with the head down, elbows out, and thumbs turned inward toward the body (Fig. 12). Once the stomach and chest are clear, the head and arms are lifted to avoid bar contact. Following clearance, a long body axis is established to slow rotation and create greater surface area to distribute the force of landing.

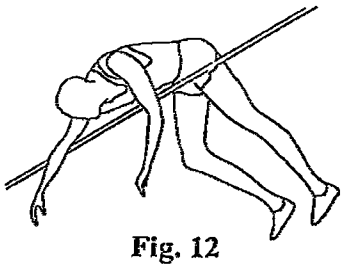


Fig. 12

Points of Emphasis

1. **STAY HOLLOW** - prematurely lifting the head and arms commonly results in chest/bar contact.

It must be re-emphasized that success in **any** phase of the vault is contingent upon effective execution of the preceding phase(s). For this reason the run-plant-takeoff sequence should be strongly emphasized in training and coaching.

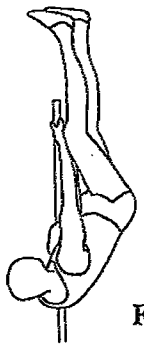


Fig. 11