

Javelin

Jeff Gorski

The javelin is among the oldest sporting events in history. Spears for hunting and warfare are some of the earliest tools invented, and contests in distance and accuracy were surely part of early competitive efforts. Ancient art shows the use of spears by athletes, soldiers, and hunters. In every area of the world where records were kept, javelins are mentioned frequently. Along with the discus, the javelin was one of the events contested in the ancient Olympic Pentathlon, where it was thrown for both distance and accuracy.

As the 20th century approached and people turned more attention to sport as a means of recreation and challenge, the javelin became popular in many of the European countries that are today's strongholds of the event. The Scandinavian countries, especially Finland, and other countries in central and eastern Europe became centers of activity for javelin throwing as the first modern Olympic Games approached. The javelin had become a distance-only event, and most of the rules that govern the event today were in effect, including the standards of weight and length. While women threw the javelin at "physical culture" schools in Europe, they did not throw the javelin in the Olympics until 1932, which was when the first women's world record was recognized.

While the specifications of the javelin have been consistent since 1896 for the men and 1932 for the women (800 grams and 2.6 meters long for the men, 600 grams and 2.2 meters long for the women), changes in technology have led to improvements in the materials used to make them. The rules state that the javelin can consist of only three parts: the shaft, cord grip, and metal point. Up until the 1950s javelins were made of wood, usually birch, and seldom lasted very long; warping and breaking on impact were common problems. The decade of the 1950s brought the United States into the spotlight of the javelin world with three important happenings:

1. First came the shocking 1-2 finish by Americans Cy Young and Bill Miller at the 1952 Olympics held, ironically, in Helsinki, Finland.
2. The following year Franklin "Bud" Held became the first American to set a world record in the javelin throw, as well as the first person to exceed 80 meters (262 feet).
3. While Held, Young, and Miller dominated javelin throwing in the world, they were also influential in the technology of the event. They worked with Bud's brother Dick to develop the most significant change in the history of the event---the metal shaft javelin, which had a thicker shaft. The new technology added to the distance thrown and the durability of the implement.

Rubberized runways were built in the 1960s, which ended poor footing in wet conditions and gave more consistent results. More systematic training of athletes, especially weight training and support from sport science, helped athletes improve their size and power. By the end of the 1970s, surpassing 90 meters (295 feet) was no longer spectacular. Throwing technique and training were appropriately focused on knowing and using the flight characteristics of the javelin. By 1980 the world record was beyond 96 meters (315 feet), and some wondered whether the event could be safely held inside most stadiums.

The women were making significant progress as well. After World War II the Soviet bloc sport programs started to dominate women's athletic events, including the javelin throw. From 1949 to 1982 only one world record in the javelin throw was set by a woman not from an eastern bloc country; in 1977 Kate Schmidt of the United States threw 69.32 meters (227 feet, 5 inches). The improvement made by

the women mirrored that of the men, and rapid improvement as a result of the Held-styled javelins and scientific training brought the record from just over 55 meters (180 feet) in 1954 to over 74 meters (243 feet) in 1982. In the early 1980s excellent athletes emerged from Finland, England, and Greece to challenge the Soviet bloc dominance.

In the 1980s the distances thrown by both men and women took another big leap. Men threatened the limits of the stadiums, and women were regularly beating 70 meters (230 feet). In 1984 East German Uwe Hohn did the unthinkable---he blasted past the 100-meter (328-foot) barrier with an awesome 104.80meter (343-foot, 10-inch) throw. From 1983 to 1985 he consistently threw well over 90 meters (295 feet). With Hohn and other athletes exceeding 90 meters regularly, the International Amateur Athletic Federation (IAAF) introduced new rules for the javelin to facilitate staging the event safely inside stadiums. The new specifications for men took effect in 1986.

The new rules imposed a significant reduction in the surface area of the javelin and moved the center of gravity forward, dramatically reducing the flight characteristics of the spear. Athletes who were capable of 90 meters with the old javelin struggled to beat 80 meters (262 feet) with the new one. Elite women were throwing nearly as far as the men were. During this time the final great thrower from the eastern sport factory emerged. Petra Felke of East Germany set four records from 1985 to 1988, the final being a massive 80-meter effort.

The period from 1988 to 2000 has seen another period of consistent gains by the men as they learned techniques specific to the new javelin, while the women regressed a bit. The "big three" men javelin throwers emerged in 1988 and have been the dominant throwers at major competitions since. Finn Seppo Raty, England's Steve Backley, and Jan Zelezny of the Czech Republic were head and shoulders above the rest. However, by 1992 Zelezny was in a class by himself. As of this writing eight men have surpassed 90 meters with the new javelin; seven combined have topped 90 m a total of 21 times, while the eight, Zelezny, has more than 75 throws over 90 meters as well as three Olympic and two world championship titles. He is considered the greatest javelin thrower in history. While the women have seen their results drop a bit since their "new rules" javelin was introduced in 1999 to where the 70-meter throw is now something special, their level of athletic ability has improved greatly.

Technique

Consistent in each of the throwing events are three critical factors that influence the distance thrown:

1. Speed of release
2. Angle of release
3. Height of release

The last two are measured with the ground as the reference point. They are prioritized in the order listed; the speed of release is most important, followed by release angle, then release height. It is important to remember that sound technique controls all three critical factors so that as you become more proficient, you will improve in all of these areas, not just one. The throwing technique you use must allow the application of physical ability (speed, power, and rhythm) into all three of these areas. With proper technique you do not "throw" the javelin with your arm alone; rather, you "pull" or "sling" it through the combined effort of your entire body (figure 5.1).

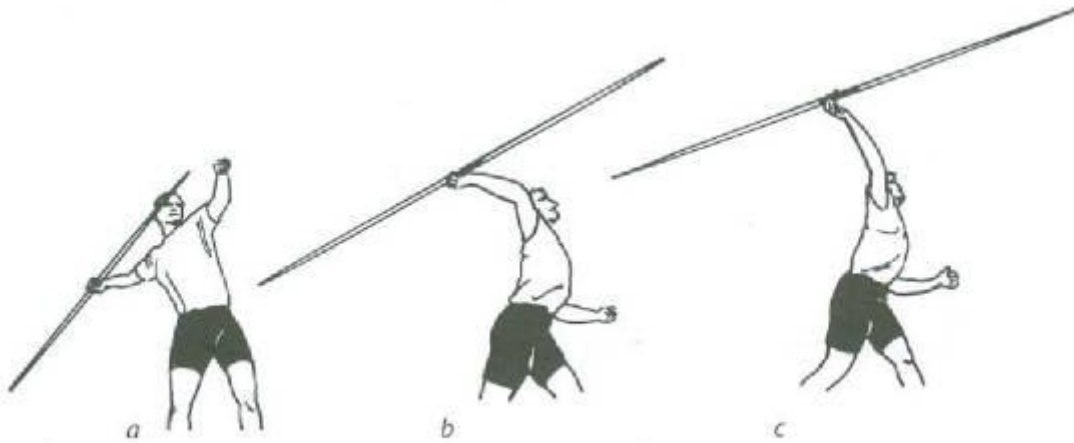


Figure 5.1 "Slinging" javelin release.

The mechanics of delivering the javelin are a summation of forces that begin from the ground and work up the body as energy is transferred from one body part to the next and ultimately into the spear. The analogy of "cracking a whip" is very descriptive of the action of the throw. Basically you want to pull the javelin over as long a distance in as short a time as possible. The movements involved break down as follows (all descriptions are for a right-handed thrower):

1. After a run-up that generates momentum, pull the throwing arm back with your hand at or slightly higher than shoulder height; turn your body somewhat sideways.

2. As you land on your right foot before the throw, bend your right knee--the "soft step"---to allow your body weight and run momentum to continue moving forward without slowing. Keep your throwing arm back and straight while extending your left arm toward the throw direction for balance; extend your left leg forward as well, waiting for the ground contact.

3. Pass your body weight quickly over your right foot and make impact with your left foot. The action of your left side is that of a brace or fulcrum; it anchors firmly to accelerate the right side into the release. Before ground contact turn your right heel out and bring the left elbow over the left foot. These actions are simultaneous and both are complete at the instant of left side bracing.

4. The bracing action causes a series of stretch reflexes that progress upward in your body; first your right hip rotates forward, then stops. That, in turn, pulls your ribs and chest forward, stretching your shoulder as your arm remains behind. Your chest stabilizes and your shoulder is whipped up and over the body, with your arm following.

5. As your arm starts to strike, turn up and bend your elbow, much like a tennis

serve, and quickly extend it as your shoulder gives a base to act on. Your arm and hand continue to accelerate after you have released the javelin. The throwing hand often slaps the left thigh as it finishes the throw.

The overall impression of the throwing action is that of an explosive, horizontal movement. Key concepts that coaches and athletes should focus on to refine technique are as follows:

- Maintained or increased momentum from the run-up into the throw
- Backward lean as the legs "run away" from the upper body
- Initiation of the throw from the legs
- Separation of the hip and shoulder axes
- Firm bracing from the left side
- Delayed arm strike

Importance of the Soft Step

A basic theme in all of these actions is the constant forward movement of the center of gravity: the hips and waist. Watch any great thrower and find a reference point behind him or her that is level and parallel to the beltline, such as the horizon or the track/stadium line. As the thrower progresses along in the throw, little or no vertical movement during the crossovers usually results in a long throw (figure 5.2). Keeping the center of gravity moving level and forward is key to long throws, and the "soft-step" action is the key to this happening.

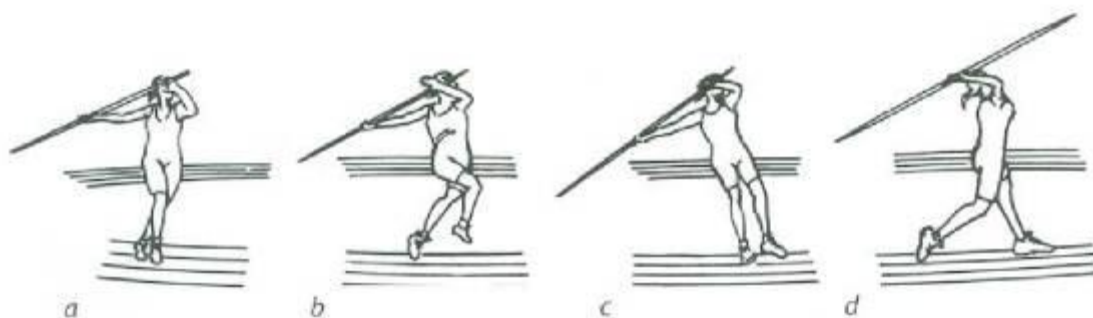


Figure 5.2 During the crossovers, there should be little or no vertical movement, with the hips staying level to the background reference point.

The most critical aspect of throwing technique is the rapid transfer of the body's center of gravity into the braced left side; every other part of the throwing mechanics depends on this foundation movement. Ideally, this is done without losing any speed/momentum from the right leg touchdown to the braced left side during the throwing crossover. The energy is then transferred up the body segments into the javelin during release. Because the "nonaction" of the right leg (soft step) is what allows this weight shift to occur, practicing this skill is very important. There is not a willful drive or push of the right leg; instead, the action is an active turning inward or dropping action of the right knee as the right foot rolls onto the toes and drags on the ground. It's very helpful to think of the right leg "getting out of the way" of the hips (figure 5.3) as they move quickly into the left. If you feel the right leg working or driving, you have slowed down or stopped. The action of the legs during the entire run-up and crossover pattern must be directed forward and horizontal. Any vertical action by the knees and hips will disrupt the path of the center of gravity and detract from the final delivery position. Throwing the javelin is "long jumping with a stick in your hand," so you must focus on getting the mass (yourself and the javelin) accelerating horizontally into a sudden bracing that transfers the energy of the run into the shoulder/arm/javelin unit.



Figure 5.3 Soft-step action: The right foot rolls onto the toes and the hips move forward to shift the weight to the braced left side.

A good way to visualize the technique is to "leave" the throwing shoulder as far behind you as possible while getting the center of gravity over the left foot quickly. A "drawn bow" is very descriptive of this position; the phrase "reverse C" is also used. This is a position that is extremely powerful as it puts almost the whole body into a stretch reflex, but it is also fleeting—you are there for a fraction of a second. The bracing left side, if done correctly, turns you "inside out," and this contorted position begins a jackknife action that launches your right side, and then the javelin, around and over the left side fulcrum. The plant of your left side is quick, and power transfers quickly into your throwing shoulder if it's done correctly. A good mental picture is to think of the plant as a "trigger" that starts the throw. You will sense a dynamic stretch in your trunk and shoulder followed by a very fast and active follow-through of your right shoulder after release. You get into and out of this "launch" position so quickly that you may only sense the impact position or the "chasing" action after the release. If you can "feel" your body moving through the reverse C, you've lost speed between your right foot and left foot landings as well as important elastic reflex ability. In other words, you're "arm throwing." Using leg action to give speed to your throwing shoulder cannot be a minor focus; it may be the most important part of throwing technique! And it is impossible to do without a fast, level path of the center of gravity into the bracing left side.

With a clear idea of how and why the soft step is the critical part of the technique used to throw the javelin, it will be easier to understand how it works in the entire run-up and delivery action. There are three main parts to the throwing technique:

1. Run-up, which develops momentum and rhythm for the next phase
2. Transition steps, which put the javelin and body in position for delivery
3. Delivery of the javelin

Each of these segments has a specific result that will add to or detract from the distance thrown. The success of one phase has a positive effect on the phase that follows; likewise, a failure in one part makes a good end result very difficult, if not impossible. As mentioned earlier, there will be personal variances in how these constants are performed, but they must work together smoothly to have long throws result from the effort.

Run-Up

The run-up is perhaps the easiest skill to master, yet its importance in producing long throws is often overlooked. Simply put, the run-up is a smooth, accelerated run while carrying the javelin. It is relaxed, without muscle tension, and should develop a rhythm that allows constant acceleration after the javelin is withdrawn.

Length of the Run-Up

The length of the run-up can vary greatly-anywhere from 6 to 20 steps may be used. Usually, the more experienced throwers can make use of a longer, faster run-up. The development of momentum in this part of the throw is essential to the success of what follows. It is much easier to move and contort your body if it is "lighter" as a result of momentum gained in the run-up. Beginners do well with a 4- to 6-step run-up; longer runs of 8 to 12 steps are good for more experienced athletes.

Javelin Grip and Carry

The javelin is carried above the throwing shoulder, roughly parallel to the ground, with a firm yet relaxed grip. There are three generally used grips (figure 5.4) that allow control of the implement as well as a means to direct the power of the athlete into the javelin at release:

1. American grip
2. Finnish grip
3. Fork grip

The three grips all make use of the center groove of the palm as the "cradle" the javelin rests on; how the fingers wrap around the grip and hold the spear are the variables. The first grip is the American, which uses the thumb and index finger to hold the back of the cord (figure 5.4a). The second is the Finnish, which uses the thumb and middle finger to hold the cord with the index finger somewhere along the javelin shaft (figure 5.4b); and the third grip is the "fork," in which the javelin is held between the index and middle fingers (figure 5.4c). There is no "best" way to grip the javelin; world records have been set using all three. Try all three grips and use the one that feels most comfortable to you and allows the best control of the javelin.

You should spend a great deal of time becoming comfortable moving with the javelin. Various running and bounding exercises will help you feel natural moving in a relaxed, athletic manner with the spear in hand. Your grip must allow you to practice these movements without any tension. These exercises are important as they teach you to move lightly and add momentum to the body/javelin unit.

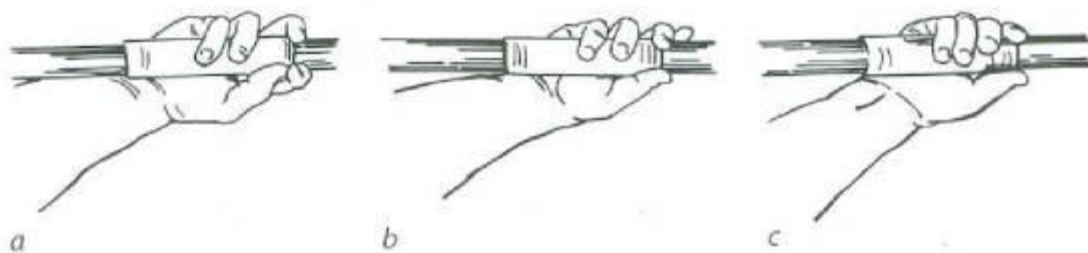


Figure 5.4 Three commonly used grips: (a) American grip, (b) Finnish grip, and (c) fork grip.

Transition

The run-up then carries you into the transition, where you withdraw the javelin into the delivery position while continuing to run in a relaxed and accelerating manner. The withdrawal is another critical phase of the throw where any jerky or tense movements can adversely affect the final effort. During the transition (figure 5.5a-c) your shoulders will rotate somewhat as the javelin is withdrawn while your legs continue to move in an aggressive manner in the direction of the throw. This twisted running posture is quite awkward, and many repetitions are needed to make this

unnatural action a "normal" part of the throw. While you want to get the javelin and arm extended back in the "launch" position as quickly as possible, you should not do so in a manner that causes any muscle tension. I find that imagining running away from the javelin or leaving it behind as you run is better than pushing the javelin back. In addition to the positioning of the javelin, the transition also begins a pattern of steps that place your body in the best position to apply the run force into the javelin at release.

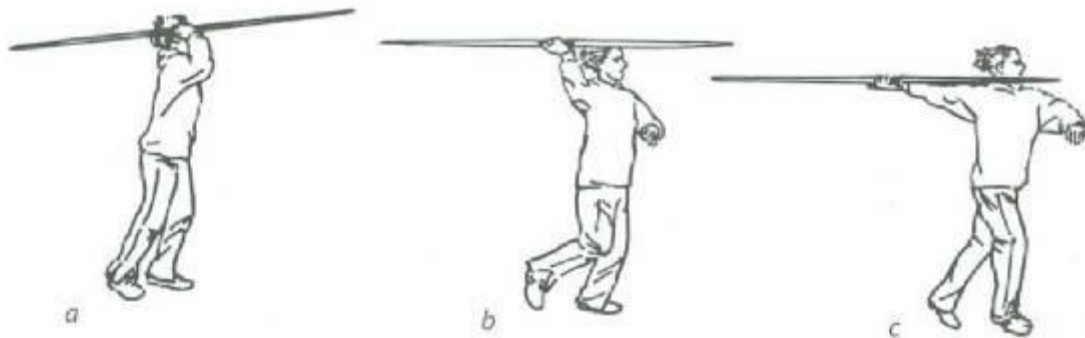


Figure 5.5 Transition/withdrawal of javelin.

Most athletes take from two to four "crossover" steps between withdrawal and delivery. These crossover steps are so named because the right leg tends to cross over the left (in a right-handed thrower) with the upper body twisted as described earlier. The final crossover is the one that puts you into position to use the soft-step action so crucial to keeping your center of gravity moving quickly into the delivery of the javelin.

There is some debate over the optimal number of crossover steps and the attitude of the body during them. In general, it is best to start a beginner with a more linear style with fewer steps: a five-step transition with two crossover steps is a good start. As the athlete gains experience, more steps or a more "wrapped" style can be tried. A brief explanation of each style follows:

- Fewer steps with hips and feet facing the throw (linear crossover). This more linear approach allows for more speed with a restricted range of motion in the hips and trunk; however, there is also a danger of "blowing past" positions needed to put the run-up momentum into the throw. This style uses a two-crossover-step pattern into delivery (figure 5.6).

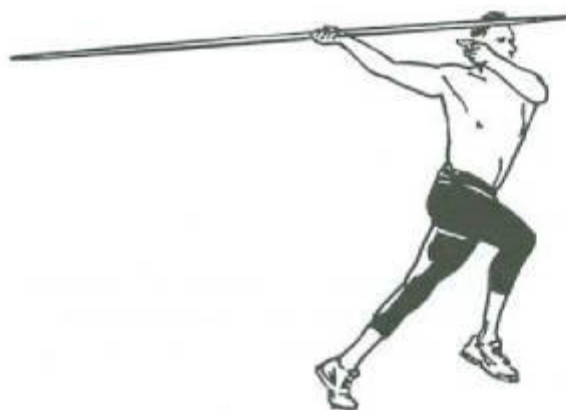


Figure 5.6 Linear crossover: Hips and feet face the direction of the throw.

More steps with the body turned sideways (wrapped crossover). This sideways, or "wrapped," position may reduce run-up speed but allows a potentially more powerful range of motion of the body during the delivery. The timing is very sensitive, and

there's a greater chance for errors. This "wrapping" style uses seven steps (three crossovers) in the pattern to the delivery (figure 5.7).



Figure 5.7 Wrapped crossover: sideways position during the crossover.

In either style, you must quickly get your legs ahead of your shoulders and develop torque between your hips and shoulders that must be maximized when the soft step takes place and the plant occurs. Just before landing your right foot during the last crossover step (figure 5.8a-c), your left leg passes your right. This occurs because on the final left leg step before the right foot soft step, you "long jump" off your left leg and experience a "floating" phase (figure 5.8c) in which you "wait" for the ground to come to you, keeping your body aligned in the launch position. When your right foot lands (figure 5.8d), the soft step begins the delivery.

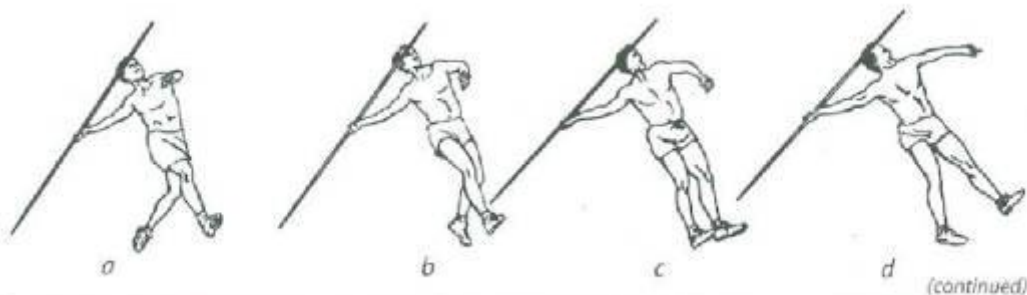


Figure 5.8 Javelin delivery.

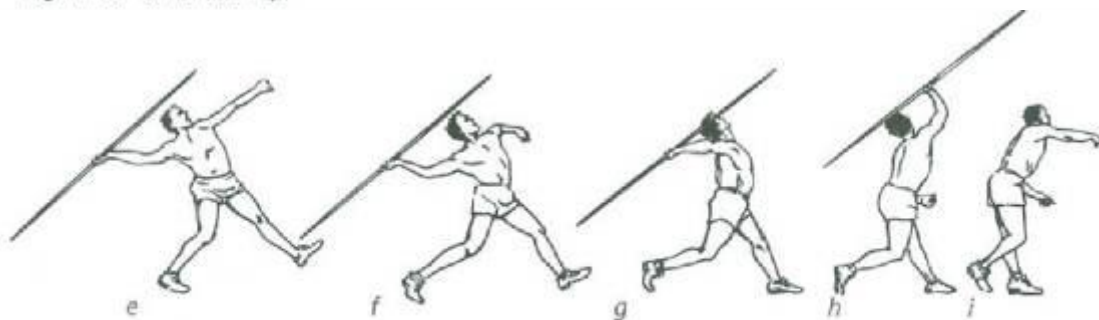


Figure 5.8 (continued)

Delivery

The delivery of the javelin is the result of a series of elastic reflex contractions of the muscle groups involved; it's a reaction to the sudden stop of the body and the channeling of the energy through the body and into the spear. In extremely simple terms, the human body is like a car: The muscles that make an action happen are the gas while those that oppose the movement are the brakes. When you try to do something with a high level of effort, you step on the gas and the brakes equally. As a result, a lot of energy is expended, but not a lot of positive action happens; you "spin your wheels." This is what happens when you try to throw far, or throw hard-

you're spinning your wheels. To use the elastic ability of the gas muscles, you need to be relaxed to avoid stepping on the brakes.

1. Upon landing on the right foot, the soft step takes place. At the beginning of the soft step let your right knee begin to drop, allowing your hips to pass quickly over and in front of your right leg. This is the critical part of the throw; a poor landing and subsequent improper soft step of the right foot is the most common technical mistake in javelin throwing. For years coaches have stressed the "drive" of the right leg into the throw. Actually, trying to drive with the right leg causes you to slow down to feel weight and the thrust of the right leg. This results in losing most forward momentum, and the throw becomes a willful action rather than the elastic reflex that comes from carrying speed into the plant.

2. Your hips are "pulled" along by the sweeping action of your left leg as it moves from the "long jump" takeoff to the plant position.

3. Your arms should be extended in a T position, generally parallel with the throwing direction. Your left arm should extend forward, and your right arm should be fully extended to the rear with the javelin parallel to your arms/shoulders at right foot landing.

4. As your right knee drops, "flop" your foot over; lift and turn your right heel out as your foot rolls over your toes. At the same time your left elbow, which has been extended in the direction of the throw, "flows" into your left side under your left shoulder.

5. The left side of your body should be facing the direction of the throw. There is a straight line from left heel to left shoulder that is leaning back from 10 to 20 degrees as you briefly wait for the left leg plant (figure 5.8e).

6. As a result of the soft-step action, your body weight moves completely off your right leg and onto the left, preceding the plant of your left leg; your left side is "pulling" your body forward into the throw.

7. At contact of your left foot a bracing action begins the transfer of energy to the javelin. You will need to work to make the weight transfer /bracing/ elastic reflex a natural action. The left side should be firm-a fulcrum that the right side accelerates around and over (figure 5.8f).

8. The plant of your left leg causes your essentially free-floating right hip to whip forward, then stop, pulling your rib cage along with it. As your ribs anchor over your hips, drag and snap your chest/shoulder over and past your hips and stomach.

9. Let your throwing arm stretch and drag behind your shoulder as much as possible (figure 5.8g).

10. As you begin to move your shoulder forward, rotate your right elbow out and up, moving through a striking action similar to a tennis serve (figure 5.8h). Sling your elbow over your shoulder, dragging the hand and javelin, then extend it as it snaps your hand forward (figure 5.8i). This applies the last portion of power into the javelin as you release it into flight.

11. The entire action of your right side is accelerated and anchored against a firm left side and ends in a dynamic "chasing" action of the javelin as your body continues to accelerate after release.

From a biomechanical standpoint, the sequence of a body segment moving then stabilizing is very important. The preceding segment must be a base that the next segment accelerates against, just as the firm left side is the anchor the right works against. If a body segment is still moving, the following segment cannot reach its full potential acceleration. Each successive segment moves faster than the previous one, then stabilizes for the following segment to anchor against as it accelerates. The hand reaches its maximum speed after the javelin is released, because it then has no resistance. A biomechanical force velocity plot of the ideal throw shows a smooth, increasing speed path followed by an abrupt stop for each body segment, with the highest speed just before the stopping action. When throwing is done like

this, it feels effortless; these are the "easy" throws that go far. There is little stress on the body, and the potential for injury is very low. Learning to use the "chain reaction" just described is not easy, but it is the best way to have both long throws and an injury-free career.

In terms of technical training, the soft-step or deep knee action of the right leg is something you must practice in high volume to make it a natural part of your throwing technique. Because this action is the basis for the center of gravity movement, it must be performed and practiced with a number of steps (five or more) to add momentum. You must learn how to transfer your body weight quickly and smoothly; this is not a skill that can be mastered by static (standing) exercises or throws. The intensity of the exercises can vary tremendously depending on the speed of the run into the exercise, but they must be done with some steps before the throwing crossover to master the horizontal soft-step, weight-transfer skill that leads to a good delivery position and maximum elastic reflex ability. The elastic reflex that gives the best delivery position comes from the relaxed, "surprise" blocking action of the left side without the loss of any horizontal momentum at the right leg touchdown.

Technique Drills

In terms of physical properties three areas must be addressed in the training of a javelin thrower: technique, flexibility, and power. This section will address methods of developing proper technique; sections on flexibility and power development will follow. All three of these components are equally important; the balance in training priorities is determined by the experience and ability of the athlete. A physically weak athlete with good technical ability, for example, would maintain good throwing movements while improving power capabilities.

A most overlooked but extremely important part of training is the improvement of specific and general flexibility. The light weight of the javelin along with the extreme positions needed to apply force over a long range are often forgotten. The great Hungarian thrower of the 1960s, Gergely Kulesar, once said, "less strength is often an advantage," meaning that you have to learn good mechanics to throw far; Al Cantello, a former world-record setter, asked, "How strong do you have to be to throw something that weighs 800 grams?"

A large volume of throwing at low intensity is needed to develop the motor skills and timing of the crossovers and delivery; they must flow together smoothly to get the best results. The majority of the throwing exercises need to be done from a step pattern to learn to channel the momentum of the runup and crossovers into the javelin release. A good start is using a five-step pattern: L-R-L-R-L, in which the athlete has a word cue for each step. I like "1 (L), 2 (R), jump (L) and (R) throw (L plant)" (this is for a right-handed thrower). Standing throws are only good for developing the upper-body strike and throwing power.

The two technical concepts that have the greatest positive influence on how far the javelin will fly are

1. release speed and
2. accelerating path of the center of gravity into a firm block.

You should spend most of your technique development time in these areas. You can work on the release speed aspect in a number of training areas; technique, flexibility, and power training all can contribute to improving release speed. For accelerating the center of gravity, most of the work done will be of a technical nature, with power/release speed improvement being a by-product of throwing while doing the technique exercises. The movement of the center of gravity into the plant without a loss of momentum is difficult to master but has the potential for developing huge release speed. In tests on elite javelin throwers using pressure plates, low readings of right leg activity (no pushing on the plate-a soft step) resulted in both higher release velocities and longer throws than readings that indicated the athlete had

"pushed" with the right leg. The elastic reflex that gives the best delivery position comes from the relaxed, "surprise" blocking action of the left side without the loss of any horizontal momentum at the right leg touchdown. You have to develop the ability to move into the blocking action without any tension in the body, especially in the shoulder and arm. Any muscle tension will detract from your ability to get a great stretch and position that would add to the release speed. A perfect throw starts with a near simultaneous landing of the right and left feet, with the right hand as far behind the body at left foot touchdown as possible.

Different parts of the throw can be trained by using various exercises and weights of implements. For example, heavier medicine balls (3 to 4 kilograms or 7 to 9 pounds) and overweight javelins (200 to 400 grams or 1/2 to 1 pound over standard weight) are used to learn the action of the hips and legs in accelerating a heavy resistance, while lighter implements (regular and underweight) are used to train the faster portions of the throw, such as the shoulder and arm strike. It may be helpful in planning technical training to think in terms of generating momentum during the run-up and crossovers and directing this momentum into the javelin during the plant and delivery. The athlete and the javelin must move as a synchronized whole from the start of the run-up through the release.

Medicine Ball, Weighted Ball, and Javelin Throws

Throwing medicine balls (2 to 4 kilograms or 4 to 9 pounds) with two hands from a stand and from a few steps teaches the center of gravity movement and how to channel the power from the hips up into the shoulders and arms. As a general rule, you should work with heavier objects earlier in the training periods and progress to lighter ones as you refine the skill and work at a higher speed. Starting with heavy implements gives you something to pull against and makes feeling the positions of the throw easier. These are awkward positions, and you need to learn how they feel and what is needed to get into them. You have to spend time being "uncomfortable" so you know what it feels like.

Medicine ball throws are followed by single-arm throws with balls (800 grams to 1 kilogram or 2 to 2.2 pounds) or heavy javelins, also from a stand and from some steps to more closely copy the actual throw. During any of these exercises you must pay attention to using excellent technique. The movement patterns developed in these exercises are the basis of performance. In all of these exercises, the effort is generated from the large muscle groups and progresses up the body to the shoulder/arm strike.

STANDING MEDICINE BALL THROW

To get the most out of this exercise, keep your arms "long." In other words, don't bend your elbows too much. Do bend your knees, however, to help create a big arch prior to the throw (figure 5.9).

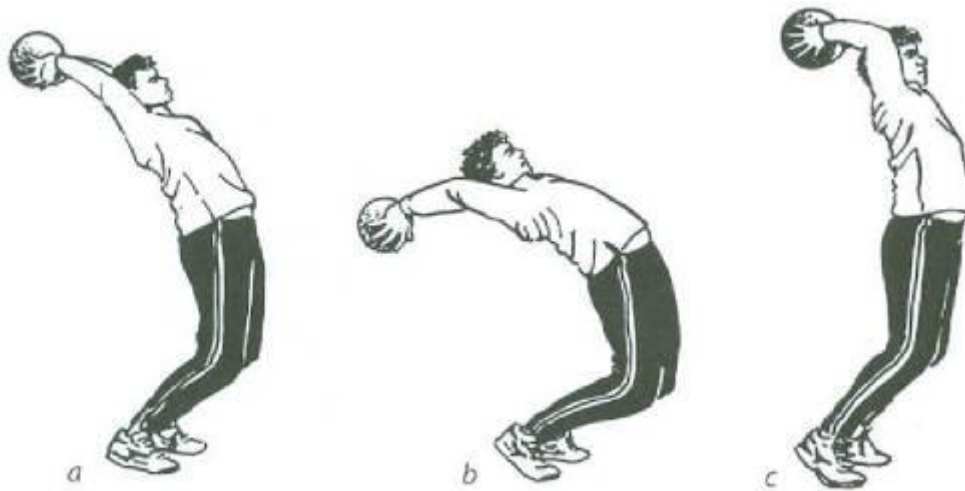


Figure 5.9 Standing medicine ball throw.

WINDUP MEDICINE BALL THROW

In this throw, sweep your arms in a big circle and shift your hips ahead of the ball. Turn the back foot early in the throw (figure 5.10).

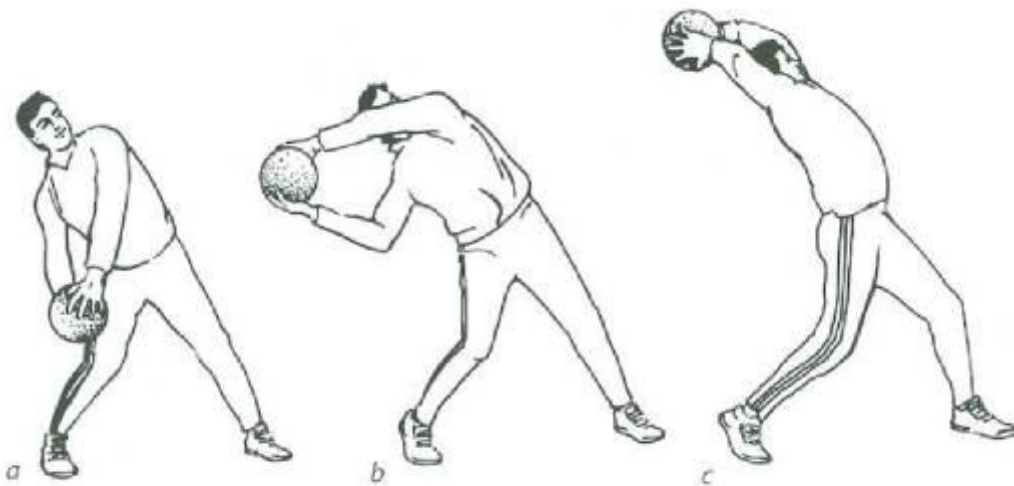


Figure 5.10 Windup medicine ball throw.

THREE-STEP MEDICINE BALL THROW

In the three-step throw, strive for a quick right-left landing on the last step, and keep the hips moving forward into the throw (figure 5.11).

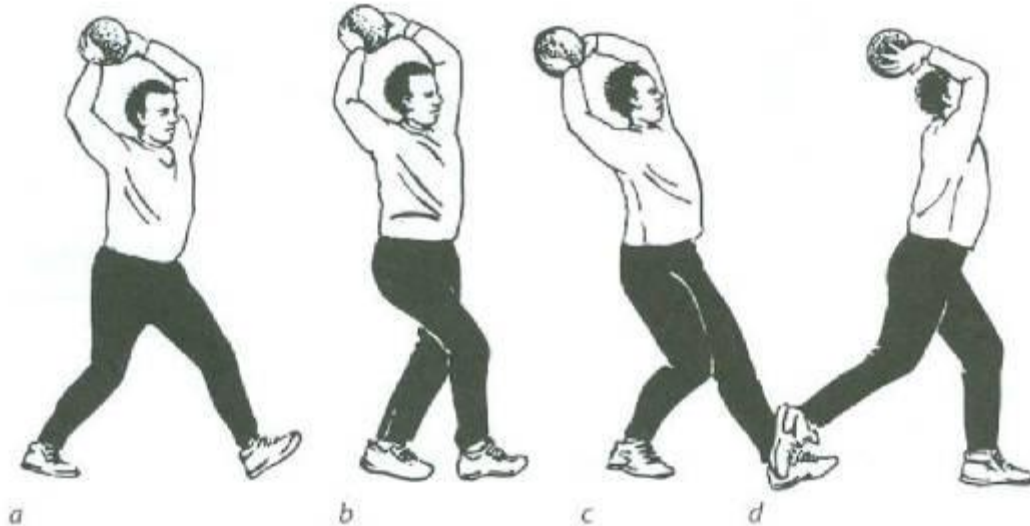


Figure 5.11 Three-step medicine ball throw.

Single-Arm Throws

Since the best exercise for a javelin thrower is throwing, much of the technical work is geared toward improving the throwing skill and specific qualities of that skill. Overweight objects such as javelins and weighted balls (100 to 400 grams or 1/4 to 1 pound over standard weight) are used to improve throwing power, to learn the "crack the whip" delivery rhythm, and to improve specific flexibility. These exercises can be done from a standing position and from steps or a run-up. During winter training it is good to throw objects other than a javelin into a net or against a wall so the focus is on learning the pattern of movement without regard to distance thrown---to learn the feel of correct throwing. Javelins are also thrown to ensure that power is applied correctly during the release.

THREE STEP JAVELIN THROW

In this drill, it's important to keep the hips moving level and actively turn the back foot before the plant (figure 5.12).



Figure 5.12 Three-step javelin throw.

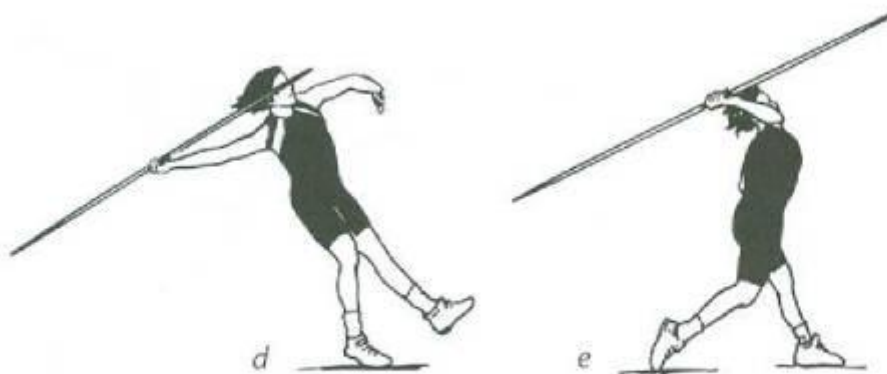


Figure 5.12 (continued)

Running and Crossover Exercises

Equally important are drills and exercises that teach how to get to the delivery position-learning the run-up and crossovers. Throwing from some steps is one of the best ways to learn this action, and repeated runs and crossovers with the javelin are needed to feel comfortable with the entire action. During any of the running or crossover exercises, the focus is to move the center of gravity in a path level to the ground. The main effort needs to come out of your thighs and hips rather than your toes and ankles; think of running with knees bent and pushing/pulling your hips with the thigh action. This is not sprint training; your upper body is being "left behind" by your leg action, so you must not lean forward while doing these exercises. This type of training, along with the throwing exercises, make up most of the work a javelin thrower needs. It develops specific power as well as ingraining throwing technique. Twice as much time should be spent doing this than any other training.

Runway drills improve parts of the approach and crossovers that position you to best deliver the javelin. Errors in these phases of the throw should be corrected with individual drills for that phase; then you should move to the entire approach and delivery, putting the entire throw together. Repeated running and withdrawals plus continuous crossovers are excellent ways to improve these areas. On the crossover work include sessions that address specific actions such as the left leg takeoff/right knee drive and both legs working in extension.

Simulation Exercises

Simulation exercises imitate some part of the throw and help in developing specific flexibility. Exercises with elastic tubing, ropes, pulleys, axe or hammer swings, or partner assistance are all good for focusing on a particular aspect of the throw. These exercises closely mimic the throwing motion with power flowing from the ground up; the legs begin the movement and contort the body into the positions required by the exercise, which ends with the shoulder/arm striking action. Simulating the throwing position by pulling against ropes or elastic tubing, swinging weight plates in the throwing motion, and swinging hammers or axes at an overhead target are very useful exercises.

Elastic Cord Pull

Start by dropping the right knee, then roll the shoulder over the hips. This helps practice a smooth transfer of body weight into the braced left side (figure 5.13).



Figure 5.13 Elastic cord pull.

PLATE SWING

Sweep the plate in a big arc as you shift your hips into the left leg plant by dropping/rolling the right knee (figure 5.14). Don't imitate the delivery or arm strike in this drill.



Figure 5.14 Plate swing.

AXE SWING

Make a big sweeping arc as in the plate swing, then roll your shoulder as in the elastic cord pull (figure 5.15). Strike the target over your planted left foot.

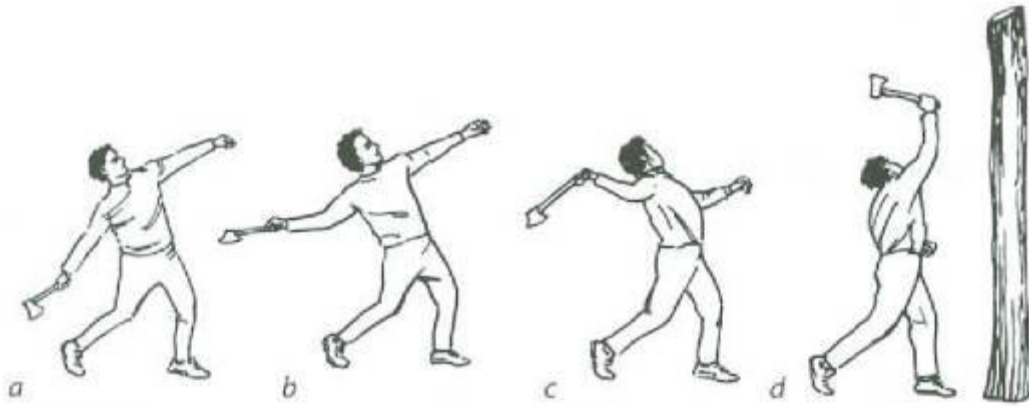


Figure 5.15 Axe swing.

Mental Movies

"Mental movies" is a term I like to use to address the psychological aspect of the throw. Technique training must focus on developing a particular throwing technique. While all javelin throwers perform the same actions (run-up, transition, and delivery followed by some sort of recovery), they do not look the same as they go through those movements. All athletes have their own unique style that evolves as they focus on the technique that is best for them.

Watching yourself throw on video or film is especially valuable in helping you correct mistakes; it can give you a blueprint or image of your style. From this basic image you can then spend "practice" time visualizing your perfect throwing technique; you can perform thousands of throws without ever leaving home! This often overlooked area can be very valuable. Knowing what you want to do in training makes the task easier. It's more difficult than it sounds, however; to have the discipline to be totally focused on a mental image for extended periods of time (15 to 30 minutes) requires practice.

Flexibility Drills

Flexibility adds distance to your throw by allowing a greater range of motion over which to pull the javelin. Imitating positions in the throw to gain specific flexibility has a big carryover to technical improvement. These are the simulation exercises discussed earlier. You also need to improve flexibility in body segments most involved with the throw. The greatest range of motion possible is essential for good results.

Throwing Simulation Exercises

Throwing simulation exercises that use elastic cord, rope, javelins, or pulleys to "hold back" the throwing arm/shoulder while "pushing" the hips into the plant are among the best training actions. When doing them, start the action from your legs and actively move your lower body forward; try to get as much distance as possible between your plant foot and your throwing hand. In addition to the simulation exercises listed in the "Technique Drills" section, stretches with the javelin are shown here. Some exercises can also be done with a partner who can help with proper positions and carefully add stretch in these exercises.

HIP AND SHOULDER LUNGE

Drop or roll your right knee to put your hips over the "plant." Use the javelin to keep your shoulder back (figure 5.16).



Figure 5.16 Hip and shoulder lunge.

PARTNER PULLOVER STRETCH

In this exercise, a partner holds both wrists, then leans forward and pushes against your lower back to create the stretch (figure 5.17).

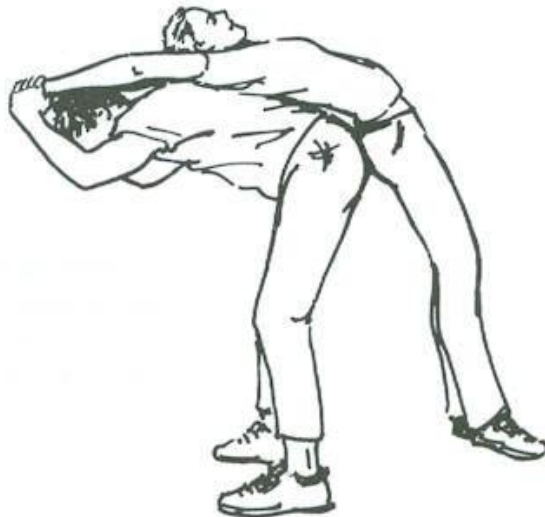


Figure 5.17 Partner pullover stretch.

PARTNER SINGLE-ARM STRETCH

In this stretch, keep your hips stable by kneeling. Hold your left shoulder firm as the right shoulder is pulled back (figure 5.18).

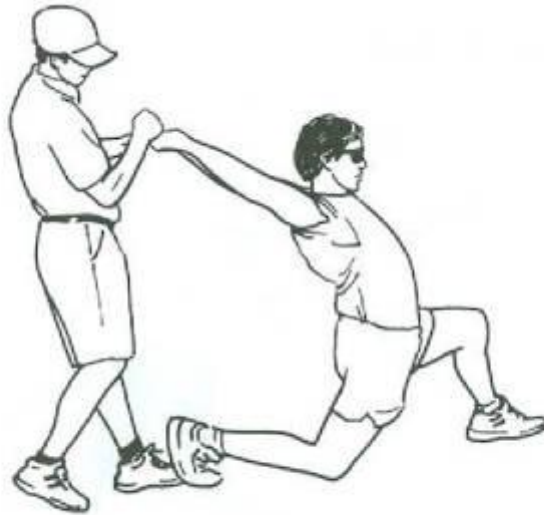


Figure 5.18 Partner single-arm stretch.

Specific Flexibility Exercises

Specific flexibility exercises are done to improve range of motion in the body segments most involved in the throw. Special attention is paid to the elbow, shoulders, lower back, ankles, and groin, which are the areas of highest stress during the throw. Partner exercises are also an important part of the flexibility routine and copy the extreme positions that occur during the delivery. In addition to those listed earlier, exercises to stretch the elbow, chest and shoulders (with a partner), hips, and back are shown here.

ELBOW STRETCH WITH JAVELIN

Lift the tail of the javelin to add stretch (figure 5.19).



Figure 5.19 Elbow stretch with javelin.

PARTNER CHEST AND SHOULDER STRETCH

Lie on your stomach, put your hands behind your head, and have a partner lift your elbows to create a stretch in the chest and shoulders as well as the lower back (figure 5.20).



Figure 5.20 Partner chest and shoulder stretch.

BACK ARCH

Lie on your back, with your knees bent and hands by your head. Push up into a back arch; push your hips high to feel the stretch (figure 5.21).

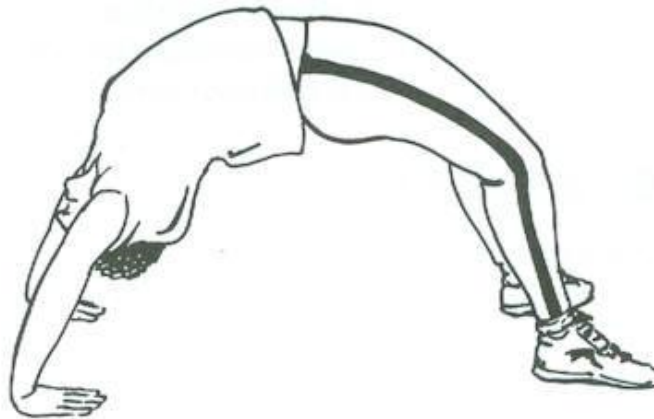


Figure 5.21 Back arch.

SHOULDER STRETCH

Push your hips forward to help feel the stretch (figure 5.22).

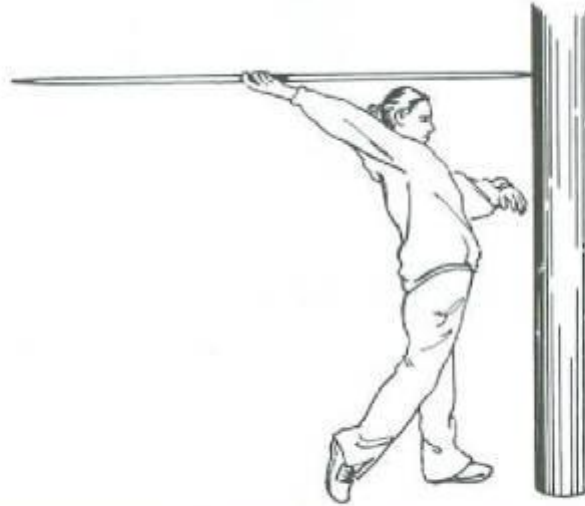


Figure 5.22 Shoulder stretch.

General Athletic Flexibility

General athletic flexibility refers to a general method of improving elastic ability. It usually involves some sport movement that requires good range of motion. Swimming and gymnastic exercises on rings and bars or on the floor are excellent choices for this area.

Power Training Drills

As with flexibility training, there are different methods of power training. Specific, general, and athletic power are all important for throwing farther. All of these areas are important; the makeup of the athlete will determine the amount of training done in each. The most return for time invested comes from specific power training, since it also involves technical training. General power is one area that is overused by javelin throwers; they often have higher power levels than their technique allows them to use. This situation usually leads to injury.

Specific Power

Specific power training involves imitating the throw by throwing heavy objects. Exercises that involve throwing overweight implements are discussed in the "Technique Drills" section; exercises that train the throw using resistance are excellent to correct a problem and ingrain an important technical movement. Exercises using pulleys, elastic cords, or axe/hammer swings also do a great job in developing specific power. Some specific power exercises that are very useful copy some portion of throwing technique or improve explosive ability, both of which are helpful in throwing farther. Pull-overs, twisting exercises with plates and barbells, and cleans and snatches all directly improve specific power and, consequently, throwing ability. Explosive jumping such as hurdle hops, bounding, depth jumps, and standing long and triple jumps all should be included in the training of any javelin thrower. These jumping exercises should closely copy the rhythm of the javelin itself: The foot contacts the ground for a very short time, but a lot happens while it is there. "Bare feet on hot coals" describes what you want in jumping work. The goal of training is to throw the javelin farther, so when planning the training sessions, always ask, Will what I'm planning to do help me (or my athletes) throw farther?

PLATE TWIST

Keep your knees bent to "lock" the hips; twist your shoulders, plate, and head as a unit from the waist (figure 5.23).

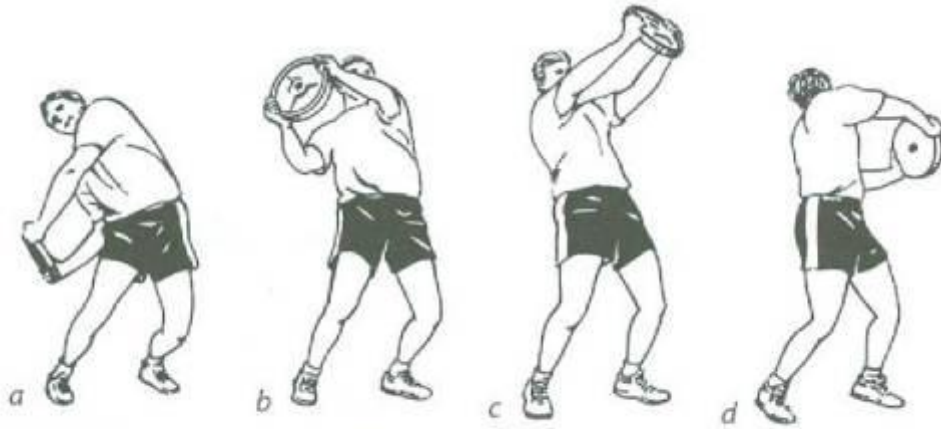


Figure 5.23 Plate twist.

DEPTH JUMP

Drop from an elevation of 18 to 36 inches (46 to 91 centimeters) and rebound quickly off the ground, moving forward (figure 5.24).

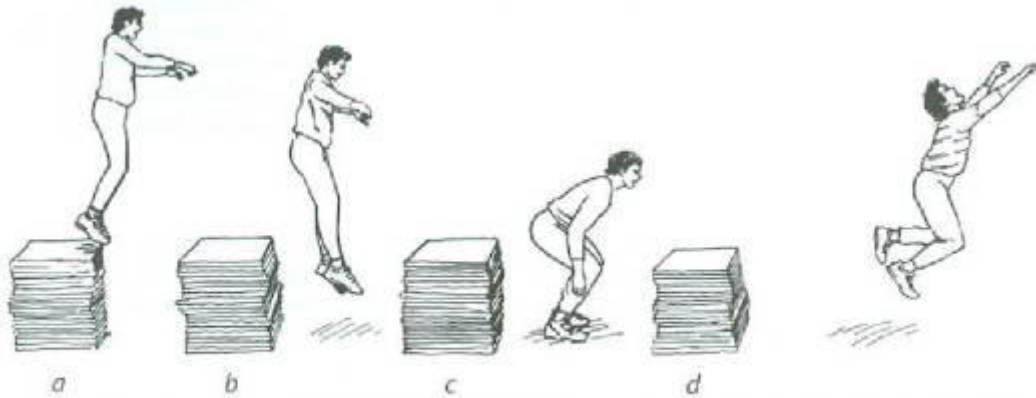


Figure 5.24 Depth jump.

PULL-OVER

Keep the arms "long" by bending the elbows only slightly. "Pull" the bar from the ribs and chest, not the shoulders (figure 5.25).

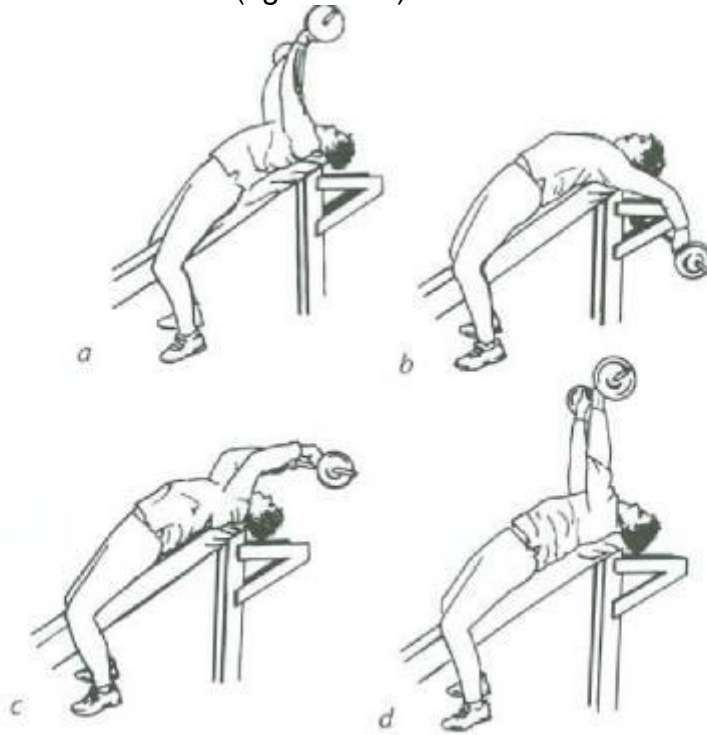


Figure 5.25 Pull-over.

General Power

General power is developed by weight training, which is further broken down into power, Olympic, and ancillary lifting. Power lifting includes the traditional lifts-squat, bench press, military press, pull-over, dead lift, and lat pull or row as well as high pull, jerk press, lunge, or step-up. The Olympic lifts are quite athletic; distance thrown often improves as athletes lift more in the snatch and clean. The ancillary lifts are specialized to the javelin thrower and are important in strengthening any of the "weak links" in the chain of the throw. Those that are most useful are plate swings with one and two hands, hip snatches, and "skin the cat" snatches. Weight training sessions can have great variance; you can combine lifts from different groups in one session or just one area. The sets/reps and intensity are discussed in the training cycle section, but as the season draws closer, you should increase the speed and decrease the weight.

TWO-HAND PLATE SWING

Same idea as the medicine ball throw; the arms make a big circle while the hips move forward (figure 5.26).

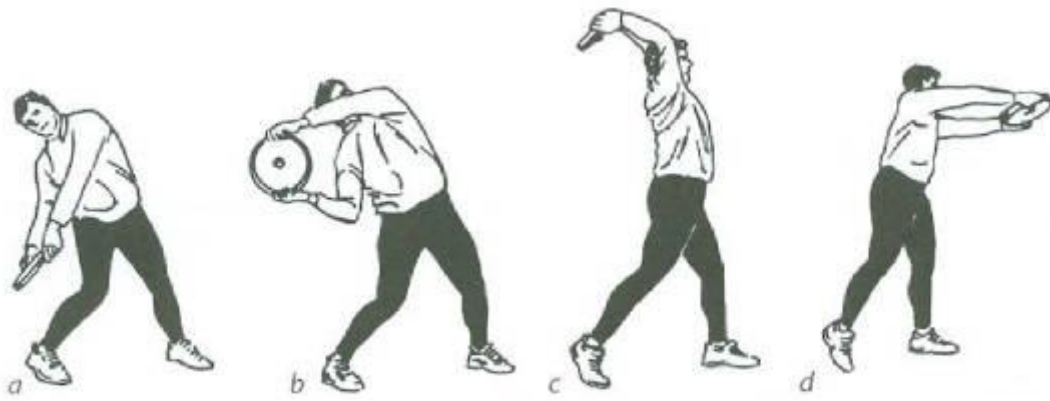


Figure 5.26 Two-hand plate swing.

HIP SNATCH

With the bar at the hip/thigh joint, bend over at the waist to start. Get the shoulders "clear" as you move the bar straight up (figure 5.27).

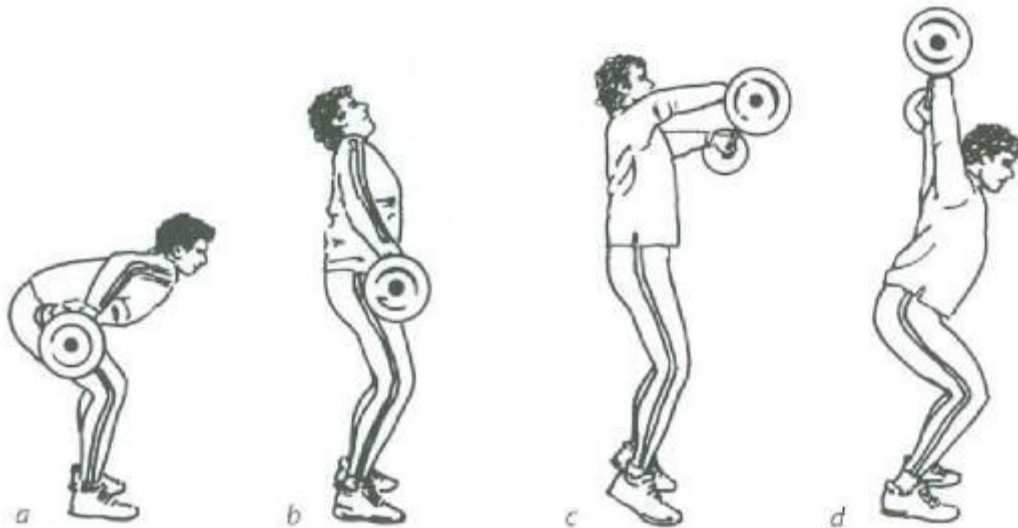


Figure 5.27 Hip snatch.

"SKIN THE CAT" SNATCH

Place your hands on the bar in a wide grip. From a hanging start, move the bar smoothly overhead to a deep arch in back, then pull back to start. This is an advanced exercise and should only be done by throwers who are already at a high level of conditioning (figure 5.28).

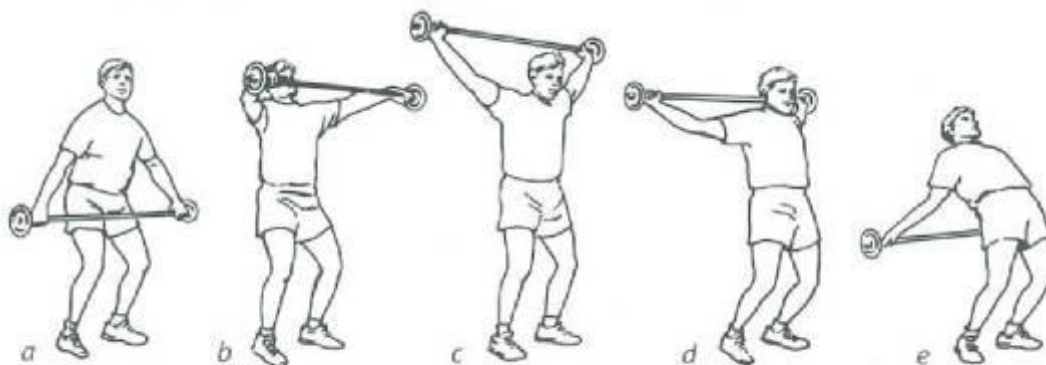


Figure 5.28 "Skin the cat" snatch; then reverse sequence.

Athletic Power

Athletic power training is where you learn power application. Explosive sport movements make up this training; jumps and hops over objects, shot and weight throws, sprinting, and gymnastics are part of this training. This starts as sport games, such as basketball, but from winter to the season dynamic training is needed and more power movements are used. Hopping over hurdles, sprints and crossovers uphill, floor exercise, work on the rings and high bar, and throws with shots in many directions develop power and rhythm-the ability to channel forces in sequence toward an end result. This training also develops "relaxed speed," which will help you to accelerate quickly without losing your elasticity.

Sample Training Program

Regardless of your level, there are three different phases or cycles of training to consider: conditioning, preparation, and competition. They can range in time from months for the Olympic-level thrower to weeks for the high school athlete. As the names indicate, each of these periods of training has a primary goal. During the conditioning phase the primary goal is to develop a base for future training to build on as well as to correct any weak areas in throwing technique. The goal of the preparation phase is to gain a higher level of both physical and technical ability that will translate into longer throws. The competition phase is geared to bringing peak technical and physical skills together at the important meets in the season.

Conditioning Cycle

The level of training during the conditioning cycle is broad-based with low intensity and large volume. The training loads during this time are typically about half of maximum effort and are performed for long periods of time.

Table 5.1 offers an example of what can be done in this training phase; it gives an outline of the variety of training needed at this time. Feel free to make adjustments to this program to suit your needs and the amount of time you have available to train in this cycle. If time is short---say, a high school preseason situation---it would be best to spend most of the time doing throwing drills and crossover work at low levels of intensity with high numbers of reps to condition yourself and start to groove the throwing movement pattern. Technical movements at this time must be done correctly and repeated many times to ingrain a pattern of movement that will serve as the core of higher-intensity technique work in the following cycles. A high volume of correct movements helps to erase poor habits and groove the new pattern of throwing. Your goal in this cycle is to become a well-conditioned athlete with a firm grasp of your throwing technique.

Table 5.1 Conditioning Cycle Workouts

Monday	Tuesday	Wednesday	
15 standing throws w/ overweight javelin	3 × 15 throws w/medicine ball: soccer style and w/three steps	1½ hr sport games: basketball, soccer, volleyball, or handball	
20 three-step throws w/ overweight javelin	3 × 20 twisting medicine ball exercises	1/2 hr special flexibility	
5 × 600 m @ 2:30 min	4 × 15 reps weight training: squat, snatch, pull-over, rows		
	1/2 hr swimming		
Thursday	Friday	Saturday	Sunday
5 × 100-m crossovers	Same workout as Monday	Rest day	Weight training:
6 × 100-m hill runs			4 × 12-15 reps of
Medicine balls as on Tuesday			squat, clean, lat pull-down,
3 × 10 shot throws: backward, overhead, and forward from squat			incline dumbbell press, pull-over, plate twist
			25-min jog

Preparation Cycle

During the preparation cycle you will increase training intensity to further condition your body for the rigors of the competitive season. The volume (number of activities and repetitions of each activity) of overall training will drop as the intensity increases; stress on the body and spirit is considerable. At this point you are preparing to compete. In fact, the psychological factors involved in dealing with the stress of training and the higher expectations that go with intense sessions help you adjust to the stress of the competitive season. These more challenging sessions require that you include more rest in the planning of training to avoid injuries and burnout. The technical training is done with more speed and more steps to mirror the full throw; the physical training is also raised to a higher level. The running is over shorter distances but faster, the weights lifted are heavier, the jumping is more explosive, and the throwing is more aggressive. Table 5.2 shows how a weekly training schedule for this cycle differs from the weekly training schedule for the conditioning phase.

The level of this training is much more demanding than in the conditioning cycle. Be sure to rest between sets in the runs, lifts, and throws to assure a nonfatigued level of effort during the entire training session. Variations in training depend on experience and physical ability; there is a fine line between challenging work and overtraining. Your individual needs will influence the structure of the training routine; for example, if you are a strong and powerful athlete, you will do less work in the weight room and spend more time improving technique. This is the time to address your weaknesses and improve them. It is important that all physical and technical abilities be as balanced as possible. During this cycle you develop the proper mix of speed, power, flexibility, throwing technique, and "warrior" attitude to prepare you for the coming competitions.

Table 5.2 Preparation Cycle Workouts

Monday	Tuesday	Wednesday	
15 standing throws w/ overweight javelin	4 × 20 medicine ball throws: soccer, three-step, and five-step	25-30 min simulation exercises w/weight	
2 × 20 three-step throws w/ overweight javelin	5 × 20 twisting medicine ball exercises	20 min jumping/bounding	
2 × 12 five-step throws w/ overweight javelin	5 × 8-10 reps weight training: snatch, squat, pull-over, row	15 min special flexibility	
6 × 300 m at 45 sec	1/2 hr swimming		
Thursday	Friday	Saturday	Sunday
8 × 60-m crossovers	Same throwing as Monday	Rest day	Weight training:
8 × 75-m hill runs	1/2 hr aerobic activity: jog, cycle, or swim		5 × 8-10 reps of squat, clean, pull-over, lat pull-down, incline dumbbell fly, plate twist
Same medicine ball exercise as Tuesday: 2 × 15 reps			6 × 100-m strides
2 × 10 shot throws: backward overhead and forward from squat			

Competition Cycle

During the final or competition cycle, training exercises are performed at a very high level of intensity, with rest between sets and hard training sessions to allow proper recovery. This is the time to compete; all the work to get you ready physically and technically should have been done by this time. Training is done to hone the "razor edge" for top results in important meets. Speed is most important now, and training activities are generally done at high speed levels. The weekly cycle in table 5.3 shows the focus of training.

The focus of this cycle is to be ready to throw far. Make adjustments according to your ability/experience and the level of competition: Pay more attention to technical perfection before major meets. Along with the physical peaking of the competition cycle, you should also be working on sharpening your mental focus so you are healthy and excited to compete. The psychological aspects of this time period cannot be overlooked; you should be confident that all the previous work was correct and useful and that your throwing technique is the best possible. It is important that you enter important meets with high levels of confidence in your conditioning and technique.

Table 5.3 Competition Cycle Workouts

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
10-15 throws w/overweight javelin from stand and steps 10-15 throws w/javelin from jog into step pattern 6-10 throws from full approach w/regulation or light javelin 20 min jumping/bounding	3 × 12 throws w/medicine ball from three to five steps 6 × 60 m over hurdles 6 × 60-m crossovers 20 min runway drills Weight training 4 × 4-6 reps squat, snatch, pull-over, plate swing	15-20 throws w/overweight javelin or ball from steps 15-20 throws w/underweight javelin from short and full runup 6 throws w/full run-up w/normal javelin; meet simulation 80-90% efforts 15 min jumping 10 × 50-m sprinting	Weight training 3 × 5 squat, clean, pull-over, lat pull-down, plate swing 15 shot throws: backward from squat and soccer-style throw-in 20 min swimming	Light training; pre-meet warmup 15 min runway drills 10 min non-throwing arm throws	Competition	Rest day

This chapter has addressed the many aspects of technique and training involved with throwing the javelin. While you must perform basic foundation movements to throw well, you can (and should) tailor these basics to meet your specific needs and abilities. The goal of this chapter was to teach you these basic movements, show how they relate to good results, and explain how to apply them in your training. Knowing what has to happen and when is an important part of developing your maximum ability in any skill event; how these are accomplished and in what style is where your unique ability plays a hand. A better understanding of the event and what is required for success will help you plan your training and ensure your improvement. While I have put forth a number of accepted and successful methods of training and technical improvement, there are many ways to train successfully. By knowing the important technical and physical aspects of training, you can address your individual needs more readily and with better results. The underlying question for any routine should always be, Will this help me throw farther? If the answer is not a firm yes, there is reason to question that routine.

Because of the unique nature of the javelin delivery, you should devote a great deal of time to becoming comfortable with the movements that position your body for the "launch." This is especially important in the U.S. culture where throwing sports stress the upper body only in the throwing motion and neglect the concept of delivering the javelin as a result of running into a sudden jolt. Rhythm, relaxation, and elastic ability are more important for success in this sport than brute power. Remember that the javelin only weighs 600 to 800 grams (1 1/4 to 1 3/4 pounds).

Throwing a variety of implements at different intensities and step patterns is the best way to improve both technique and throwing power and build confidence in your skill. Other types of training are useful in improving certain physical abilities that aid in correct throwing movements; weight training, plyometrics, gymnastics, and jumping event training all are excellent for this.

The violent nature of the elastic reflex delivery that results from planting requires that you be well conditioned to handle that stress and channel the energy you created into the javelin. A well-balanced training program that addresses your needs will give good results in both distance thrown and freedom from injury.