Development of the Soft-Step Javelin Technique

By Jeff Gorski, USATF Men's Javelin Development Chairman

Note to readers: This was Jeff's first published article (1981), but still the foundation of all technique he teaches; nothing has changed!

The purpose of this article is to facilitate the training of javelin throwers, by means of explaining often-used terms and looking at the actual mechanics of the throw. I believe that the training and performance of throwers would increase dramatically if the aura and mystery of the "European Technique" is cut away.

NOTE: The advantages of the European or soft-step technique are many. It provides a powerful throwing position and allows use of the large muscle groups of the body without sacrificing momentum. While it may take a bit more time to master, once learned, the soft-step will allow for constant improvement in performance. As the thrower becomes more comfortable with the technique and can increase his speed, he'll be able to throw farther. It must be pointed out, however, that the proper technique must be learned in order to make use of this greater speed. Any athlete can run through the throw and approach faster, but unless the movements are purposeful, his throw will likely be shorter than his previous marks.

The Javelin

Essentially, the throwing technique of European athletes is a result of careful studies in human movement. Some basic knowledge of physics and kinesiology, with the ability to apply these physical laws to athletics, are a great aid in improving the thrower's performance. What the Europeans have done, for the better part of four decades, is to see how each body part involved in the throw can be used most effectively. Let's get down to basics.

The javelin is an aerodynamically designed implement that closely follows the laws of physics. For this reason, the factor with the greatest influence on the throw's distance is the speed of the javelin at release. The greater the speed of release, the greater the distance of the throw, all other things being equal. Knowing this, the technique and training of the athlete must be geared toward developing the greatest possible speed on the javelin at the release. This speed is measured against the ground, not against the athlete.

Conditioning

Since the release speed is so important to the length of the throw, it is obvious that the faster the athlete is moving, the further the throw should be. However, the speed of the approach and step pattern will depend entirely on the "technical preparedness" of the athlete.

Technical preparedness simply refers to the level of physical conditioning and how familiar the athlete is with his technique. The more skilled and experienced the athlete, the faster the approach run should be.

We can now see that the most important aspect of the athlete's training should be the perfection of a technique that will allow and use the fastest possible approach speed. While specific techniques are as individual as the athletes, basic fundamentals are found in each technique.

These fundamentals include maintaining or increasing run-up momentum from transition steps to the throw, leading the throw with the hips, a noticeable backward lean, a firm brace or plant with the left leg (right hand thrower), and delaying the arm strike.

While each of these are essential to a good throw, they all stem from one function: maintaining momentum. Other factors influencing the throw that can be controlled are the alignment, the angle of attack, and the angle of force of the javelin at release. Alignment is defined as keeping the long axis of the javelin in line with the axis of the shoulders, and keeping both in line with the proposed path the throw.

Angle of Force

The angle of force is the difference between the path of the javelin's flight at release and the path of force or power exerted on the javelin by the thrower (Diagram 1). The smaller this angle, the better. This deals with the adage of force at zero, a perfect release. The angle of attack is the difference between the flight path of the javelin's center of mass, and the actual position of the center point of the javelin during flight (Diagram 2). The angle of attack is a direct result of the angle of force. Again, the smaller this difference, the better, because a large angle of attack means the javelin will stall in the air.

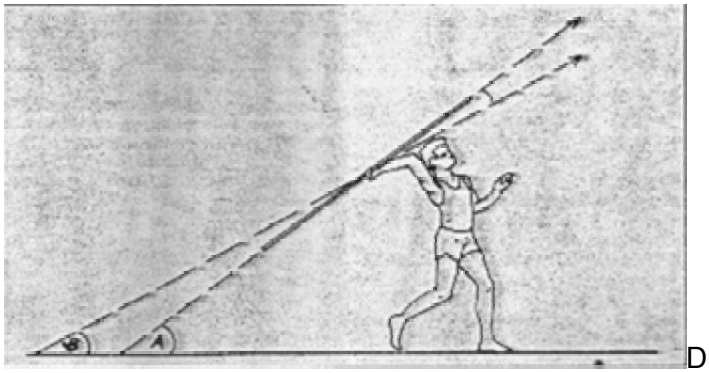

Diagram 1

The angle of force is the is the difference between the path of flight (A) and the line of throwing power (B), both measured to the ground. Angle A - angle B = angle of force.

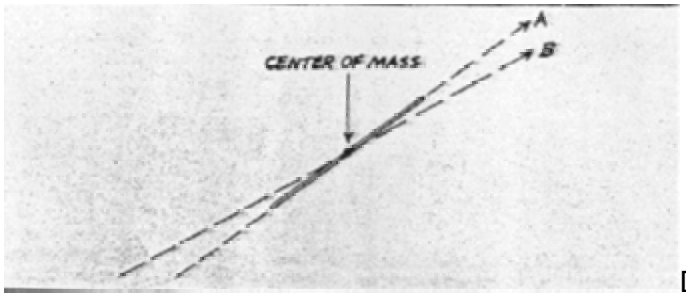

Diagram 2

The angle of attack is the difference between the path of flight of the center of mass (B) and the angle of the javelin to the ground.

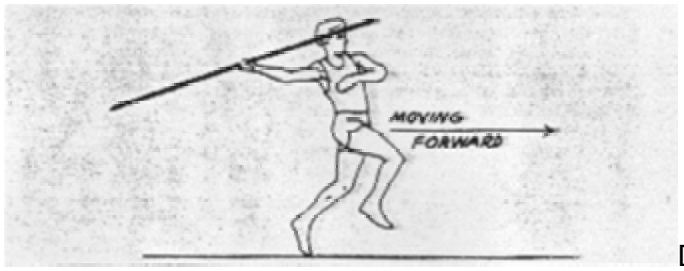

Diagram 3

The action of the leg during the crossover must be exclusively forward, with little or no vertical movements.

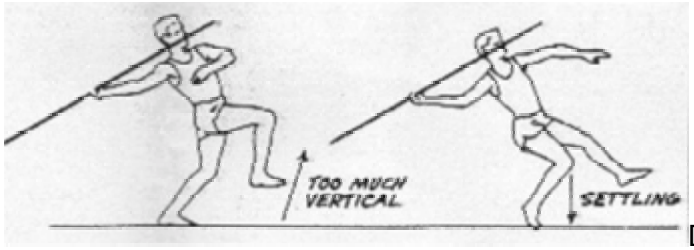

Diagram 4

Too much vertical movement during the crossover will cause "settling" on the back leg, so the athlete is throwing from a "falling elevator."

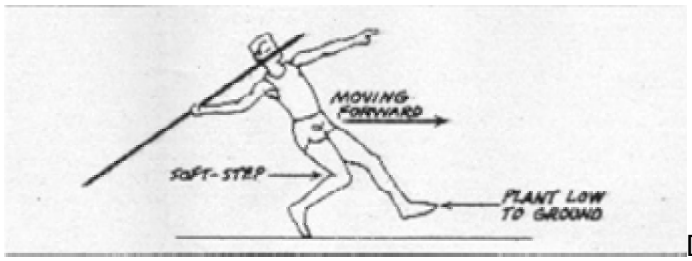

Diagram 5

Driving into the plant, the back leg continues to bend so the hips pass over the back leg unhindered. The plant leg is out in front and close to the ground.

Diagram 6

An arm delivery of 45 degrees to the shoulder axis will give a longer pull and allow better muscular efficiency.

Momentum

Of greatest importance, however, is maintaining a, uninterrupted flow of momentum from the approach into the throw. To do this, the athlete must accelerate through the step pattern, so that the last two steps, the crossover and the plant, are the fastest of all. It is also extremely important that the plant leg contact the ground as soon as possible after the crossover. The longer it takes to ground the plant, the greater the chance of planting “in the bucket” and losing valuable power.

It is helpful for the thrower to think in terms of running away from the javelin to delay the arm, and running onto the plant. This running action has been called the soft-step or deep knee position by various authors. The soft-step, or some variations of it, is what allows effective use of momentum in the throw. As the thrower approaches the crossover, javelin is well back, the shoulders are above the hips and the legs are driving forward, giving the whole body a slight backward lean. Going into the

crossover, the athlete drives powerfully forward off the left leg (right hand thrower), while the right shin is pushed as far forward as possible with minimum vertical motion (Diagram 3).

This action must be fast and close to the ground. Too much vertical motion will cause the thrower to settle on his power (right) leg, negating the run up and plant. Throwing from this seated position, similar to a baseball pitcher throwing from a stretch, will substantially limit distance and the use of momentum (Diagram 4). The athlete is essentially throwing from a standing start.

From the position described in Diagram 3, the athlete must quickly pull the leg forward so he is further inclined to the rear. At this point, the athlete is just about to strike ground with his right foot, the left leg is extended forward waiting to plant, and the left arm is starting to open the chest. The hips and center of mass (or gravity) are well ahead of the torso (Diagram 5). If the crossover is done correctly, there should be no significant loss of momentum.

The Soft-Step

When the right foot does touch ground, the so-called soft-step takes piece. It is essential that as much forward speed as possible is maintained, so that it may be transferred into the throw. The soft-step allows the hips and center of mass to pass quickly over the power leg, so that the plant jolts the hips and starts the throw. As the hips pass over the right leg, the right knee bends (and continues to bend) so that the forward movement of the hips and the center of mass is unhindered.

One must not confuse the soft-step with settling on the right leg; settling is a result of too much vertical movement in the crossover, or a slow pull-through of the left leg. Soft-stepping is a passive movement by the right knee and leg that positions the center of mass for a forward thrust. Simply put, it lets the hips stay ahead of the rest of the body without any loss in forward momentum going into the plant. Through the crossover and plant, the athlete should stay as low to the ground as possible. Diagram 5 shows the athlete's position prior to the plant.

The soft-step allows for a very fast plant after the cross, since the plant leg is already in position and the thrower is close to the ground. This quick plant, plus the rapid forward movement of the hips, will aid the throw significantly. The majority of the run-up momentum is transferred into the throw by the plant if the soft-step is done properly. The proper execution of the soft-step will ensure that the other phases of the throw take place; the hips will lead, there will be a noticeable backward lean, the plant will be quick and straight, and the arm will be delayed in its pull.

As the throw progresses from the plant, notice the crack-the-whip body action starts with the large muscle groups of the lower body and finally moves up to the hand. The right leg drives forward while the right heel rotates out, thrusting the hips over the plant. As the plant leg straightens and stabilizes the hips, the throwing arm and shoulders stay back, increasing the horizontal rotary torque. The left arm goes high, wide, then in tight to the left side, to open the chest and increase the stretch on the right shoulder and arm.

By now the center of mass has passed directly over the plant and the whip-like arm strike takes place. Here, too, the progression from heavy to light segments continues. The chest rotates forward and stops, the shoulder rotates forward and up, then stops, followed by the arm strike with the elbow leading the hand, palm up. Films indicate the action should be a 45-degree angle to the horizontal shoulder axis, a three-quarter arm throw, for the longest and most efficient pull (Diagram 6).

Regardless of the technical variations used, the key to developing a great javelin thrower is the mastery of the soft-step concept, both physically and mentally. Far too many U.S. throwers stress the value of a powerful throwing position, and end up stopping on the right leg or settling on it, baseball style.

Yearly Training

Training for perfection of the total throw, the approach technique and throwing mechanics must be a year-round endeavor. A rough idea of how the training priorities rate follows: the year is broken down into three general areas---preparation, pre-season, and the competitive season.

During the preparation period, around September through December, the development of strength and power are stressed. Throwing done during this time is limited to once or twice a week, concentrating on good form rather than distance.

During the pre-season period, around the end of December through March or April, development of power and strength continue and the amount of throwing increases. The throwing is a bit more intense, but good form in the soft-step must still be a prime goal. Speed development also begins.

During the competitive season, the intensity of strength and power work lessens somewhat, although weight work must be maintained. The prime objective is to use the proper technique, with as much speed as possible.

Training sessions should include throwing javelins, hand weights or stubbies, etc., from full approach and shorter step patterns, emphasizing the development of the soft-step. The concept of accelerating into the throw, especially the speed of the last two steps, should be stressed. Arm and hip position are also important; the am should be parallel to the shoulder axis, and the hips should lead the throw.

Strength and Flexibility

Strength and flexibility are two qualities a javelin thrower must have to excel. While American throwers are among the world's strongest, the flexibility concept is still somewhat lacking. In fact, physiologically, both qualities are closely related. The strength of a muscular contraction depends on the degree of strength in the muscle. The greater the stretch, the stronger the contraction.

Relaxation

Relaxation also comes into play since a relaxed muscle has a greater range of motion than a tensed one. One often hears of the thrower who unloads record throws in warm up, only to tense up and throw far shorter when it really counts. According to physiological taws, a relaxed muscle will stretch more quickly and with greater range, thus producing a faster, more powerful contraction than a pre-tensed muscle. European athletes spend quite a bit of time on flexibility, especially in the areas of the shoulders, upper and lower back, and the hips and ankles. A frame-by-frame analysis of throwers like Lusis, Nemeth, Wolfermann, and others would demonstrate the needed mobility of a top-ranked thrower.

Weight Training

Weight Training would involve a number of aspects. Here we're looking to develop strength (the maximum force in a single contraction of a muscle) and power (the most possible in the shortest time). Strength development would consist of the traditional lifts, including bench press, squats, military press, curls, etc. Power would be developed by more competitive lifts and exercises, like the clean and jerk, the snatch, the jump and reach, basketball dunking, long and triple jumping, sprinting, and weight throwing, to name a few.

The importance of leg strength and power cannot be stressed enough. As an example, let me cite Lusis, who, at 6' 195 lbs, could straddle 6'4" and long jump over 24 feet. Begin and end all training sessions with at least 15 minutes of mobility and flexibility exercises.

Conclusion

The United States has numerous throwers who have exceeded 70 meters, but only two have ever topped 90 meters. Obviously, there are plenty of strong arms around. What is needed is an understanding of the event, and the factors that influence performance. Fred Luke, a 1972 Olympic finalist for the U.S., in Jon Hendershott's “Team Effort Lofts U.S. Javelin Fortunes" (Track and Field .News, April. 1973) said the Europeans “get down to very basic fundamentals and find out what makes a javelin go 300 feet.” That's what the soft-step technique is all about.