

# Developing Event Specific Strength for the Javelin Throw

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The training for track and field events is highly specific and requires precise technical development. This holds true not only on the track and in the field but also in the strength development of these events.

The javelin throw is very different from the other throwing events. As a result special consideration must be taken when developing a training program to produce event specific strength. Coaches must remember that an athletes' adaptation to training is specific to the stress placed on them. This article will focus on exercises and methods to help a javelin thrower increase this specific strength.

Developing event specific strength is important for any sporting event. Event specific strength is strength that the athlete can actually apply to their event. That is, strength developed through the actual ranges of motion and at the specific joint angles and speeds that are used when performing the event. This differs from general strength, which is strength of the prime movers without regard to the range of motion, joint angle, or speed that may occur in the actual event. An athlete with a high general strength (400lb. Squat) but low specific strength may compare less favorably to an athlete with moderate general strength (250lb. Squat) but high specific strength. This is because the athlete with low specific strength will not be trained to take full advantage of their greater general strength. In effect, event specific strength exercises help to bridge the gap between traditional general strength work (squat, bench press, etc.) and the athletic field. Low levels of event specific strength will limit or hinder the potential for maximum performance.

The javelin throw has several special considerations that will affect the type of training these athletes perform. In general, power for the overhead thrower is primarily generated with leg extension, hip rotation and trunk flexion.<sup>1</sup> According to Coleman, these components generate more than 50% of the forces in a standing throw.<sup>2</sup> As a result, training emphasis should be placed on the quadriceps, hip flexors, gluteals, and abdominals.<sup>3</sup> In addition to this, the increased speed developed in the approach of the javelin throw places a considerably greater load on the athletes' legs (when they hit the power position).<sup>4</sup> Thus creating an even greater need for leg strength in this event. Strength development will enable the athlete to better overcome these loads so that they can proceed into the throwing motion with more velocity.

Coaches should also take into consideration the unique arm mechanics of the javelin throw. The extreme arm positions achieved in a technically correct javelin throw make exercises involving flexibility a must. Athletes need to develop elastic strength and flexibility for the arm mechanics so that they get a better transfer of power from the legs and torso. They also need to learn to take advantage of the stretch-reflex contraction, increase work capacity, and decrease the likelihood of shoulder and elbow injuries by through strength training.

A final consideration to take into account is the speed of motion and the rate of force development. The release for the javelin is much faster than the three other throwing events due to the lighter implement. For elite athletes, the velocity of a javelin release has been measured in excess of 30m/s, while a shot release is less than 14m/s.<sup>5</sup> Because of the greater emphasis on speed compared with the other throws, specific training should never be done at slow speeds. Related to this concept is total force and rate of force production. Throwing events require high amounts of force production in fractions of a second. The duration of the javelin pull from start to finish has been measured at 0.16-0.18s.<sup>6</sup> This indicates that coaches must consider not only velocity of movement, but also total force production and rate of force production. In other words, the athlete should train to produce the greatest amount of force in the shortest amount of time.

Taking these points into consideration, event specific strength training for the javelin thrower must focus on several things: a solid foundation of general strength, power development in the legs and trunk, upper body flexibility and elastic strength, and speed of movement and rate of force development. Careful planning and selection of training methods and exercises is important to develop the neural adaptation and muscular strength required to maximize an athletes' performance in this event. This article addresses a way of developing event-specific strength for the javelin thrower. The exercises are grouped according to what part of the throw they focus on: arm mechanics, hip drive, or the approach.

## **Specific Strength for the Arm**

### Axe Chop / Sledge Hammer

Purpose: To simultaneously develop strength and flexibility in the shoulder girdle, pectoral and upper back musculature.

Requirements: This exercise requires a sledgehammer or lumber axe, and a stable knee-height hitting surface such as a tractor tire, mound of dirt, or a large log.

Description: The athlete stands in front of a knee-height hitting surface. The axe / hammer is brought over the head and swung violently down on to the hitting surface. The key for this exercise is to let the weight of the axe or hammer pull the arms back so that a stretch is felt through the shoulders and upper back. This will initiate a stretch reflex contraction, while developing strength and flexibility for throwing.

Variations: This exercise can be performed with one hand or two.

Recommendations: Have the athlete initiate the movement with the whole body rather than just the arms; this will create a whip-like effect on the axe or hammer.

### Overhead Medicine Ball Throw

Purpose: To develop strength and flexibility simultaneously in the shoulder girdle, pectoral and upper back musculature, as well as the elbow extensors.

Requirements: This exercise requires a medicine ball (preferably a bouncy one) and either a partner or a solid wall.

Description: The athlete stands 10-12 feet away from a partner or 2-3 feet away from a wall. The athletes' bracing or block leg should be placed forward. The medicine ball is thrown from an overhead position. Like the axe / sledgehammer chop, the throw is initiated with the body so that the medicine ball feels as if it is "dragging behind" at the start of the throw. Once this feeling is achieved, the athlete should initiate the throwing action with the arms.

Variations: This exercise can be performed with one hand or two. Also, the athlete may "dribble" the medicine ball on the wall with a short, fast tempo and no "dragging" or stretch.



Recommendations: Throws with a partner are an excellent group warm up. Throws against the wall are a great way to end a workout because many repetitions can be performed in a short period of time, leaving the athlete with a good "pump".

#### Knockenball or Weighted Ball Throw

Purpose: To develop specific strength in all of the throwing muscles by overloading them with greater than normal resistance.

Requirements: A knockenball or a weighted throwing ball is required for this exercise.

Description: The athlete should prepare to throw as if they were going to throw a javelin. The throwing mechanics should be exactly the same. This exercise can be performed from the power position, with one or more crossovers, or with the whole approach.

Variations: The weights of the implement can be varied depending on the strength of the athlete as well as current phase of the training cycle.

Recommendations: Coaches should closely monitor the athletes' technique when throwing weighted implements. If the weight of the implement compromises the athletes' technique then a lighter implement should be used.

#### TurboJav™ Throw

Purpose: To develop specific strength in all throwing muscles by overloading them with greater than normal resistance while incorporating the added benefit of forcing the athlete to "throw through the tip."

Requirements: A TurboJav™, and either lead tape, fishing weights, or a weighted sleeve are required for this exercise. Add lead tape, fishing weights secured to the inside, or a weighted sleeve to the implement so that it exceeds the weight of the athletes' regulation javelin.

Description: This exercise is performed as if the athlete were throwing the regulation javelin. . This exercise can be performed from the power position, with one or more crossovers, or with the whole approach.

Variations: The weights of the implement can be varied depending on the strength of the athlete as well as current phase of the training cycle.

Recommendations: Coaches should closely monitor the athletes' technique when throwing weighted implements. If the weight of the implement compromises the athletes' technique then a lighter implement should be used.

### Dumbbell Pullovers

Purpose: To develop strength and flexibility simultaneously in the shoulder girdle, pectoral and upper back musculature.

Requirements: This exercise requires a sturdy bench and a dumbbell.

Description: To perform this exercise, the athlete lies flat on a bench and holds a light dumbbell over their chest with arms extended but not locked out. The arms then come back behind the athletes' head with the elbow joint remaining almost completely extended. The dumbbell is brought back until the athlete feels a stretch in the upper back, shoulders, and rib cage. At this point, the dumbbell is returned to the starting position with the arms remaining just short of being locked out.

Variations: This exercise can be performed with one arm or two.

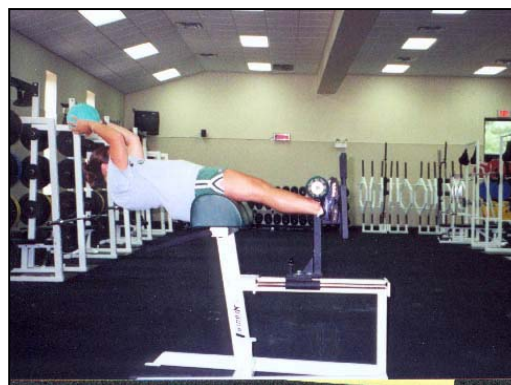
Recommendations: Athletes should avoid the temptation to “go heavy” on this exercise as this could easily lead to injury.

### Glute-Ham Medicine Ball Throw

Purpose: To strengthen the core muscles in a javelin-specific manner.

Requirements: This exercise requires a glute-ham machine or roman chair sit-up machine, a medicine ball, and a partner.

Description: The athlete sets up in the machine as if they were going to perform a roman chair sit-up with the butt resting on the pads and the



feet securely placed under the supports. The athlete should begin the exercise in the 'up position' and with arms raised overhead. When the athlete is ready, the partner throws the medicine ball to the athlete so that they can catch it with arms extended overhead. At this point, the athlete immediately descends until the trunk and arms become parallel with the floor. The athlete then returns to the starting position, maintaining the extended arms, and throws the medicine ball back to the partner.



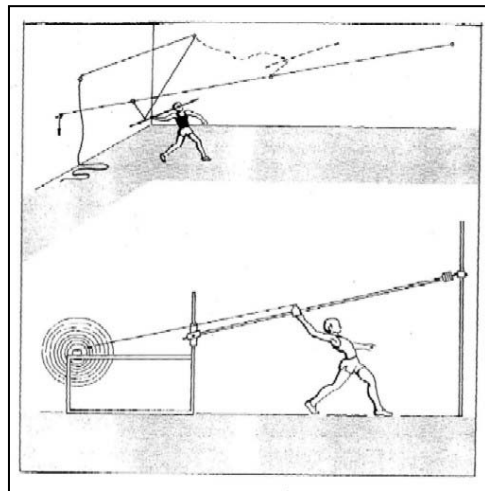
Variations: This exercise can be performed with one hand or two. An advanced form of this exercise involves using only one hand and the opposite leg for support. This variation adds an extra element of stabilization and balance to the exercise.

Recommendations: Athletes should focus on throwing with the core muscles rather than the arm.

#### Pulley-Related Javelin Throw

Purpose: To develop specific strength in all throwing muscles by overloading them with greater than normal resistance.

Requirements: This exercise requires a pulley device. If one is not available a simple pulley system can be built with the grip portion of an old javelin or a 6" piece of piping, and a cord or rope. The cord is run through the piping, pulled taut, and attached to the floor and ceiling at an angle that allows the athlete to perform a throwing motion with the piping moving up the cord in a natural path. Other more complex example of the pulley systems can be seen in Fig. X<sup>7</sup>.



Description: The athlete stands holding the piping as if they were going to perform standing throw and pulls on the piping using leg, hip, and arm strength. The exercise is completed when the piping reaches a point above the athletes' head.

Variations: Resistance can be adjusted by weighting the pipe or by increasing the friction between the cord and the pipe.

Recommendations: Ideally, the javelin grip or piping should have a diameter about 1-2 cm wider than the cord or rope. The optimal release angle for throwing the javelin is

about  $35 \pm 3$  degrees in relation to the horizontal.<sup>8</sup> This should be taken into consideration when setting up the pulley system.

### Isometric Javelin Contractions

Purpose: To develop strength in the whole throwing motion by increasing strength at various angles using isometric contractions.

Requirements: This exercise requires either a partner or an immovable object that the athlete can pull on.

Description: The athlete assumes a standing throw position. At this point the athlete grabs the immovable resistance at a given arm angle. An isometric contraction is applied against the resistance. The tension in the muscle should build progressively and reach its peak in 2-3 seconds. Each set should last for 5-6 seconds.



Recommendations: Due to the angle specificity of isometric training, sets should be performed at every  $30^\circ$  to cover the entire range of motion.<sup>9</sup> For the javelin arm mechanics this means the athlete will need to perform sets at five or more locations.

## **Specific Strength for the Hip and Leg Drive**

### Javelin Box Jump

Purpose: To develop an explosive push from the back leg into the block position and strength to overcome the loading forces created by the approach and penultimate step.

Requirements: This exercise requires a sturdy box with a height ranging 6-24', and a flat landing surface.

Description: The athlete stands on the box with their back throwing leg hanging off the box. The athlete then drops off the box onto the leg that was hanging off the box and immediately proceeds into javelin throw footwork. The athlete should try to push from the back leg into the "bracing" or block position.

Variations: The intensity of this exercise can be varied by changing the height of the box or by adding resistance in the form of a weight vest.

Recommendations: To maximize the benefits of this exercise, the athlete must make a conscious effort to push from the back leg the instant it contacts the ground.

### Javelin Step-Ups

**Purpose:** To develop a quick and explosive push from the back leg into the block position.

**Requirements:** This exercise requires a 4-6" box.

**Description:** The athlete assumes a standing throw position and places the foot of their blocking leg onto the box. The foot may either be flat or slightly dorsiflexed. From this position, the athlete drives up off of the back leg while maintaining a straight, but not locked out, front leg. It is not necessary for the athlete to actually step up onto the box with the back leg.

**Variations:** Resistance can be changed on this exercise by varying the step height, wearing a weighted vest, or holding dumbbells.

**Recommendations:** A plyometric effect can be added to this exercise if the athlete quickly rebounds off the ground with the back leg once it makes contact with the ground.



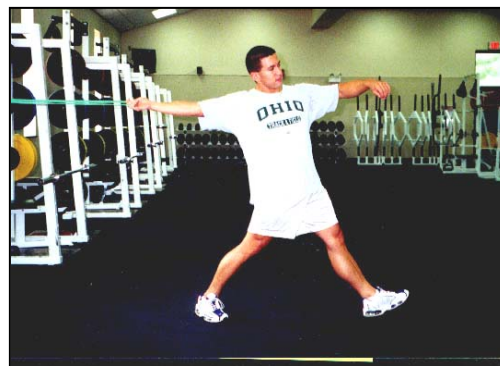
### Bungee Hip-Snaps

**Purpose:** To strengthen the core and develop an explosive hip drive and flexibility through the shoulders and back.

**Requirements:** A bungee cord or stretch bands are required for this exercise.

**Description:** The bungee is securely fastened to a fixed object. The athlete holds the free end of the bungee in the throwing hand and assumes a standing throw position. The bungee should be taut at this point. From this position, the athlete performs a partial standing throw, emphasizing good hip and leg drive. The movement is completed when the athlete hits the "Reverse C" position. This position is demonstrated in Fig. Y.

**Variations:** The resistance on this exercise can be changed by using different bungee cords.



This exercise can also be combined with the Javelin Step-Up exercise.

Recommendations: The athlete should not attempt to go beyond the “Reverse C” position. Due to the elastic qualities of the bungee (the farther it is stretched, the greater the tension) a complete throwing motion would place dangerous levels of stress on the shoulder.

## **Specific Strength for the Javelin Approach**

### Bounding

Purpose: To develop the explosive strength for the approach as well as strength to overcome the loading forces created by the approach and penultimate step.

Requirements: This exercise requires a flat 15-50m surface, preferably grass or a synthetic track.

Description: The athlete bounds 15-50m emphasizing explosiveness by attempting to achieve maximum distance with minimal ground contact.

Variations: This exercise can be performed using straight legs, alternating bounds with short runs (10m run, 15m bound, 10m run, 15m bound), carioca bounds, or crossover bounds.

Recommendations: Bounding drills can be a good way to develop the tempo or acceleration of an approach if the athlete consciously tries to accelerate or increase the tempo over the given distance.

### Crossovers up Stairs

Purpose: To overload the muscles used for explosive crossovers.

Requirements: This exercise requires a flight of stairs with consistent and even step heights and widths.

Description: Athletes run up a flight of stairs performing crossovers. The athlete should be perpendicular to the stairs and only one foot contacts each step.



Variations: A weight vest can be used to increase the resistance on this exercise.

Recommendations: Ideally, the steps should have a width of at least 18” and a height of no more than 6”.



### Resisted Approach Runs

**Purpose:** To develop strength and explosiveness through the whole approach run.

**Requirements:** This exercise requires either a weighted vest or a parachute.

**Description:** The athlete performs the approach as they would in a competition with the added resistance of the weighted vest or chute. The chute may be either strapped to the waist or carried in the throwing hand. This exercise can be performed using the whole approach or broken down into segments.



**Variations:** Adding weight or using a different chute can modify the resistance of the exercise. Another variation on this exercise would be to hold a weighted ball in the throwing hand while performing the approach against the resistance of the weighted vest or chute. This adds the extra dimension of strengthening the shoulder and core muscles.

**Recommendations:** This exercise would best be performed under the same circumstances as in a competition. For instance, if the athlete normally wears javelin boots they should wear them on this exercise; or if they compete on a grass runway they should do so in this exercise.

## **General Suggestions**

- All specific strength exercises should be preceded by a general warm-up.
- Follow a periodized training plan.
- A good foundation of general strength is necessary to maximize the benefits of specific strength training.
- More repetitions can be performed in a shorter period of time if medicine balls or weighted balls are thrown into a wall.
- Developing circuits using several different event specific exercises are an effective and convenient way to develop conditioning and work capacity.
- Technique work should be done before a hard specific strength workout.
- Keep in mind that javelin throwers are fast twitch athletes, as a result, repetitions should be kept relatively low and the speed of execution should be fast.
- Try to balance the training load between dominant and non-dominant sides. This will help in injury prevention<sup>10</sup> and develop coordination.
- Emphasis should be placed on higher volume in the pre-competitive stages of the season and gradually shift to decreased volume with lighter resistance and increased speed.
- The optimal weight of the medicine ball is dependent on the strength of the athlete. The arm velocity when throwing the javelin should serve as the criterion for selecting a weight for the medicine ball. The medicine ball should not be so heavy that it drastically

slows down the motion. For most athletes, 2.0 - 4.0k will be ideal for overhead throwing actions.

-As the season progresses, strength training for the athlete should have an increased emphasis on specific strength training with a concurrent decrease in general strength work.

-The resistance of a weight vest should not exceed 10% of the athletes' body weight. When the vest exceeds 10%, the movements become too slow and the likelihood of stress-related injuries increases.

-Speed development (throwing light implements) is recommended to balance the slower movements occurring in specific strength development.

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<sup>1</sup> Bartlett, L.R. Storey, M.D., and Simons, B.D., Measurement of Upper Extremity Torque Production and its Relationship to Throwing Speed in the Competitive Athlete. *American Journal of Sports Medicine*. 17:89-96.1989.

<sup>2</sup> Coleman, A.E., A Baseball Conditioning Program for all Seasons. In: *Injuries in Baseball*. Philadelphia, PA: Lipincott-Raven Publishers, 1998. pp. 537-545.

<sup>3</sup> Kaufman, T.M., Weight Room Considerations for the Throwing Athlete. *Strength and Conditioning Journal*. 21(4): 7-10.1999.

<sup>4</sup> Zatsiorsky, V.M. *Science and Practice of Strength Training*. (1<sup>st</sup> ed.). Champaign, IL: Human Kinetics, 1995. pp. 220.

<sup>5</sup> Zatsiorsky, V.M. *Science and Practice of Strength Training*. (1<sup>st</sup> ed.). Champaign, IL: Human Kinetics, 1995. pp. 41.

<sup>6</sup> Zatsiorsky, V.M. *Science and Practice of Strength Training*. (1<sup>st</sup> ed.). Champaign, IL: Human Kinetics, 1995. pp. 34.

<sup>7</sup> Yessis, M. *Secrets of Soviet Sports Fitness and Training*. New York: Arbor House. 1987. pp.119.

<sup>8</sup> Brown, C.H., Sing, B., and Webb, B. Chapter 16: Javelin. In: *USA Track and Field Coaching Manual*. Champaign, IL: Human Kinetics, 2000. pp. 249-264.

<sup>9</sup> Zatsiorsky, V.M. *Science and Practice of Strength Training*. (1<sup>st</sup> ed.). Champaign, IL: Human Kinetics, 1995. pp. 155.

<sup>10</sup> Wathen, D., Chapter 24: Muscle Balance. In: *Essentials of Strength and Conditioning*. (1<sup>st</sup> ed.). Champaign, IL: Human Kinetics, 1994. pp. 424-429.