

THE DYNAMICS OF THE RIGHT LEG IN THE THROWS

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The most important biomechanical principle determining throwing distance is the release velocity, and arguably presents the largest reserve for improvement. The ultimate coaching goal in the throwing events is to achieve higher release velocities. We also know that release velocity is dependant upon the enormous amount of torque created when the thrower's lower body moves ahead of the upper body prior to the release of the implement. Torque, also named moment of a force, is the product of a force and it's perpendicular distance from a point about what causes rotation. Torque not only relies on muscle contraction, but also on leverage, and achieving a good power position, from which the implement can be accelerated with great force and with proper throwing mechanics. A good power position very much depends on the work of the right leg. I firmly believe that the legs form the technical basis of the throw. So many young throwers and even senior throwers rely too much on upper body strength, and neglect to use the legs in the correct manner, in the process losing many valuable metres.

Teaching the correct technique from a young age is paramount. Throwers and coaches should understand proper throwing mechanics, and develop a feel for the throw. They should also have a clear picture in their mind what good technique looks like. Therefore good technical role models are needed, which is in abundance. For example:

Javelin throw	:	Jan Zelezny and Andreas Thorkildsen
Shot put	:	Christian Cantwell, Valeri Villi, Tomasz Majewski, Adam Nelson
Discus	:	Virgilius Alekna, Wolfgang Schmidt and Jürgen Schult
Hammer throw	:	Yuri Sedykh, Anita Wlodarczyk

Visualizing the correct throw before the actual throw is necessary, as brain activity precedes human movement.

If you repeatedly execute throwing movement incorrectly, it will become a built-in reflex, and then it becomes very difficult, if not impossible to correct these mistakes. Correct movement patterns should be established right from the beginning. Legendary Olympic discus thrower, Mac Wilkins said "There is no short cut to technique. You must understand it and what you must do to improve it". He goes on to say "If proper technique isn't learned in training, it won't magically appear in competition. A consistent level of skill must be developed through repetition in training".

And there is no better time to teach children correct technique than at a young age. One of the reasons being that certain centres in the brain responsible for motor movement matures very early. Young throwers should also be exposed to a wide variety of movement. Early specialisation should be discouraged.

The modern child has become increasingly sedentary, spending too much time sitting at school, sitting at home doing homework, sitting in front of the television set or computer. Technology is fantastic, but also comes at a price. The modern child, in general lacks co-ordination, spatial (kinaesthetic) awareness, balance, rhythm, core strength etc. It would be quite safe to say the modern child has become movement deficient, defying the statement that "movement is life, and life is movement". Therefore it is imperative that young children are inspired and motivated to engage in a wide variety of sporting disciplines.

Young throwers, if not taught correctly, will become "arm throwers", incapable of utilizing the different levers and muscles in the correct order, and incapable of utilizing the legs and trunk to create torque, leading to valuable loss of throwing distance.

And that brings us to the importance of the legs, and especially the dynamics of the right leg. Let's have a look at a few examples:

Discus - starting at the rear of the circle, the thrower pre-turns on the left foot, allowing the right leg freedom to move actively towards the centre of the circle. Once the athlete's right leg (ball of foot) has made contact with the ground in the centre of the circle, the foot should immediately continue to rotate to allow the hip axis to rotate ahead of the upper body, creating separation and torque. Kinaesthetic awareness and balance are crucial, as the body will not be able to rotate if the body's centre of gravity is not directly above the right leg.

Some throwers land too heavily in the centre of the ring, or allow the heel to drop, destroying the continuing movement of the right leg and foot, allowing the arm to catch-up placing the athlete in a position from where he/she is not able to put the hips ahead of the upper body (separation). Do not ever land on a passive right leg! Similarly, looking at the shot put glide. The thrower has to land in the centre of the circle with his/her centre of gravity above the right leg (right handed throwers) with the shot positioned behind the right hip. Only when the thrower is able to reach this position, he/she is able to actively use the right leg to cause separation between the shoulder and hip axis, and to be able to transfer rotational momentum and power from the legs, through the hips to the upper body (kinetic chain). The right foot, upon contact, should continue to rotate.

In the hammer throw the right leg should be grounded very quickly during each turn. If not, it will allow the centrifugal force to pull the thrower off balance, and in a position from which he/she will be unable to counter or resist the pull of the hammer.

In the javelin the impulse-step is paramount. The athlete should aim to "pull the ground towards him" with his left leg, allowing the right leg to actively drive into the throw. Once again contact with the ground is made on the ball and outer border of the foot, immediately rotating on the ball of the foot to get the hips ahead of the shoulders. The right knee is pressed forward and down, assisting the left leg to block more effectively, and allowing the left leg to apply more force into the ground (Newton's third law of motion). Therefore a solid left leg block is necessary, with minimal knee bend. It is imperative to wear heel spikes.

Do not underestimate the value of tendon strength. Tendons attach muscle to bone. The contracting muscle pulls the bone towards the muscle, causing movement. Tendons also possess an elastic quality, providing the muscle with additional leverage, increasing the potential for force production. During fast eccentric muscle action, it is able to store elastic energy available for usage during the almost immediate following concentric muscle action, enhancing the total force production, such encountered when the hips are driven ahead of the upper body and the muscle of the trunk, chest and shoulder are eccentrically stretched, creating an enormous amount of torque

The legs always work in harmonious unison to help generate maximum torque production and increase release velocity.

REMEMBER - NO LEGS, NO DISTANCE.