

## **7.0 – The Importance of Co-contractions**

The concept of co-contraction refers to the body's, specifically the nervous system's, ability to create perfect synchronization of opposing muscles around a joint in order to stabilize the structure. How this correlates in terms of sprinting is, as the foot strikes the ground, muscles need to quickly activate in unison to create rigidity and stiffness in the joint thus meeting the force and power demands of the movement. To make it easier to understand, visualize or even bring up a video of a cheetah sprinting at full speed. As the animal goes from a dead stop into a full sprint, hitting speeds over 60 MPH in under three seconds, the animal's dorsal line, the line from behind the skull extending into the tail, maintains the same postural positioning. Of course, sprinters and athletes clearly do not have the same physiological composition as a cheetah, however we can train our nervous system to elicit this characteristic. As the cat is accelerating all four of its feet are striking completely different ground surfaces and levels simultaneously. The cheetah is using a highly adaptive co-contraction trait to stabilize its joints and continue to accelerate through the spontaneity of surface terrain. This is co-contraction in its most prime example and the response that we want to elicit through training.

In order to function correctly the demands must be met at an even quicker rate than the velocity being created in the limbs and body during sprinting. Sometimes a lack of rigidity can downregulate the output of power if the brain feels there is an unequal ratio of stiffness versus power. Too often developing co-contractions is overlooked, not conceptualized or held to the level of vitalness as it should be. Many times, there is too much emphasis placed on standard strength training practices focusing on progressively loading an athlete in a rep range in order to become stronger. While strength and power are obviously very important aspects, it is crucial from a performance standpoint that the principle of co-contraction and time be taken into consideration, understood and applied in training sessions.

Athletes must be able to withstand high amounts of eccentric force. Meaning that the athlete should not simply "absorb" force, but they must withstand and propel under the applied tension. In turn, creating an extremely rigid movement and increasing rate of force development. An athlete will only become as powerful as the eccentric force in which they can withstand. This takes precedent over other qualities when it comes to true elite level performance. When loading an athlete, there is very little co-contraction needed to push a barbell with both feet planted on the ground. However, this is not the nature of sport, except for powerlifting. When moving at high velocity, co-contractions occur in a hundredth of a second. As the nature of the sport demands high velocity movement, the body needs to elicit these co-contractions at an even more efficient rate. Keeping in mind that co-contractions dictate many aspects of movement, most notably the ability to create explosive movement and reduce injury during these demands. For the purpose of this manual we want to develop and prevent both.

Co-contractions are also part of the stumble reflex. When someone falls or trips, the body tightens up to prepare for that fall. This occurs so you do not get hurt or fall to the ground. This primitive reflex is why when you trip on something your body synchs up

and the next step is very stiff. In order to elicit this concept and train it, we want to trick the body into thinking that we are going to trip. This approach will develop greater pretension when we hit the ground. The more pretension that an athlete possesses before they hit the ground, the stiffer the joint will be and the less energy is displaced and wasted when the athlete goes to push during their next step.

In order to use these concepts to our advantage in creating a training program, we will raise the ground. This concept is referred to as plyo-siodal training. The theory here is that by raising the ground the foot contact will happen as a much faster rate than the body is typically used to. This stimulus will force the body to adapt and create a much stiffer joint at a quicker rate of contraction. Again, picture the cheetah's varying sprinting surface filled with stones and dips. Even with this high degree of spontaneity, the cheetah continues to produce powerfully fluid strides. This idea may be difficult to visualize how to apply it to training drills however, it does not take a lot of equipment to set up and it is incredibly useful. Let's insert the cheetah's environment in our own on the track.