

Equine Biomechanics and Gait Analysis

This article will be the first of two in a series on equine biomechanics and gait analysis. I will first talk about conformation. In order to understand a horse's biomechanics and assess its motion and gaits, we first must take a horse's conformation (body structure) into consideration. To evaluate a horse's conformation for correctness and balance, it must be viewed from the left and right side, as well as from the front and back. A well balanced horse has a better chance of moving efficiently, which results in less stress and lessens the likelihood of injury. So what do we look for when we assess a horse's conformation?

First, when viewing the horse from the side, the forehand must be balanced with the hindquarters. When the forehand and hindquarters are balanced, the withers are level or slightly higher than the level of the croup, and the center of gravity is located more toward the rear of the horse. A horse's center of gravity is a theoretical point in its body around which its mass is equally distributed. This point can be found by transecting a vertical line from the highest point of the withers, to the ground and a horizontal line from point of the shoulder to the point of the Buttock.

Most horses must learn to rebalance their center of gravity when moving and when being ridden. How much weight is shifted depends on the horse's conformation, the rider's position, the gait, the degree of collection, and the style of performance. The higher degree of collection, the more the horse steps under the center of gravity with the hind limbs. When the forehand is larger than the hindquarters, a horse's center of gravity tends to be forward. This causes the horse to travel heavily on its front feet. The extra stress on the front end can set the stage for increased concussion to the feet, stress on the tendons, ligaments, and joints, and an increased chance for lameness.

Second, the top line should be smooth, the neck should tie well into the shoulder and the limb angles should be correct for that breed. Interestingly, a horse's front limbs are not attached to the rest of the spine by a collar bone as are the arms in humans. Rather, a horse's front limbs are attached to the rest of the skeleton by strong muscles that make up the shoulder "girdle." The nature of this attachment requires the horse to use its long neck to balance the motion that originates when the hindquarters engage.

There are many other characteristics of a horse's conformation that can affect a horse's movement, too. For example, the neck length should be greater or equal to the back length. The hip, from the loin to the point of the buttock, should be at least two thirds the length of the back. If the neck is shorter than the horse's back, a horse tends to have decreased flexibility and a harder time balancing its motion. Longer-backed horses tend to "hollow" out because they have a harder time lifting, and rounding their backs, and moving their hindquarters underneath their center of gravity. Horses with a shorter hip in comparison to the neck or back tend to lack propulsion/impulsion.

As you can see, a horse's conformation is a key component to movement. Some horses cannot physically or really struggle to do what we ask because their conformation won't allow them. Keep conformation in mind when purchasing a horse for a specific job. It will help both you and the horse be happier.