SADDLEFITTING BIOMECHANICS.

Hastilow Competition Saddles USA

1684 Hendershot RD, Warfordsburg, PA 17267

717-294-6757

717-294-6547

11/4/2009

All English Tack

Discussion of movement in relation to saddle fit.

Biomechanics and the movement of horses.

What is biomechanics and how does it influence saddle fit in the horse? Well there are many interesting answers to that question and to really do justice to the answer you must first look at how a horse moves its body both with and without a rider.

Simple mechanics is the coordination and organization of three distinct systems in the body, the neurological system, the muscular and ligamental systems and the skeletal system. These systems acting in concert but with individual functions move the horse from place to place. The nervous system acts by firing impulses to the muscles and tendons via nerves and the myelin sheaths, these then in turn contract and provide the force to move the bone structures of the horse.

- When we see the horse in motion our attention is taken by the muscular and tendon structures moving the skeletal, but we do not see the nerve actions that promote this movement, a horse will move in the most comfortable way for that particular animal. That decision is prompted by the animal's conformation, a horse can only do what his body will allow him to do, but repeated movements (training) and correct influence over use of the structures can make the most of a horse's given abilities. Neural pathways developed through use allow the horse to move freely and without strain or unnecessary effort, this in turn influences the development of muscle and the external shape of the horse. The skeleton is the system that shapes the horse and once it is formed will only be modified through training by strengthening the bone density; you can't alter the bone shape or length with better training, so good conformation for the activity the horse will perform is important. The proportions of the bones in the body and the angles of the joints determine the stride and movement of each horse enabling them to move in a certain way which is predetermined by these structures. Improvement of the habitual neural pathways and muscle tone and development will assist this carriage but little will change its basic function.

There are many descriptions of how the horse supports himself, the suspension bridge described by Dr Bennett, the cantilever model or I have heard both of a "washing line" or "bow and string", which ever image you choose to see, the living structures or support cables of the tendons, ligaments and muscles hold the back, shoulders and hindquarters of the horse allowing him to move in a given way, balanced by the neck and head. To move the horse must apply tension through these systems, stabilizing the back between the two pillars of the forehand and hindquarters and moving the legs to propel the animal forward. It is this use of the back, both in a static and dynamic way that affects the fit of the saddle, and dependent on the development, conformation and movement pattern, the fit of a saddle will change with the stride and gait.

The back is a fairly rigid system, but not entirely, it resembles a table in its makeup .Over time the strength and support offered to the structure lessens with every year the horse is alive, in a young horse the support is given by the strength of the joints in the neck, shoulder and hindquarter, these levers

allow the back to either dorsiflex or to passively stop it from sagging. When we put a rider on the thoracic region of the back with a saddle we are loading the area more to the front of the horse, this front lever is longer and less bulky in it's makeup and it has a longer balance pole, the neck, this means the rider is positioned nearer the torque point of the front lever than to the back one giving the front the advantage of being nearer the load to be lifted. The back lever on the other hand is further away from the load, but it possesses the more powerful lever because it is shorter and broader with a great muscle density and mass. This means although the shorter balance line would give the hindquarters less torque the muscle mass gives it more strength. The neck and shoulder support area develop and support the saddle and rider, whilst the hind quarters arch the back from behind and propel the horse into a carriage successful for movement.

The horse has to use the ligamental system through his back in one of three ways, with his back round, with it in neutral or with it hollow. The horse adjusts these positions by tension or release in the lumbosacral region or the withers, the spine is more flexible at these points and they act as pivots to alter the position of the neck and head or the hindquarters. In reality the horse spends most of his time in a neutral position maintaining enough tension through the system to allow for easy movement, altering this when danger is upon him or if he wishes to lie down or roll, obviously as previously said the actual comfortable position with opposing forces holding the torso in position depend on the skeletal structure. Depending on how much natural tension or slack there is in the system determines the natural back position of the horse, longer backs and flatter croups predispose a horse to more slack in the topline of the system and therefore make fitting a saddle more complicated. Similarly a back that is too tight or rounded through the topline will find the placement of a saddle difficult also.

ROUND BACKS: When a horse rounds or engages his back correctly by tightening the abdominal set of muscles which in turn lowers the pelvis by rotation at the lumbosacral junction and tones the ligaments, he is producing a rounder or more collected outline. This allows the horse to produce more bend in the hind joints and offers a greater reach in the step. The primary result of this spinal flexion is the lifting of the neck from the base with a telescoping effect through the head and neck which allows a higher but softer carriage with more elasticity and energy transfer from the hind quarters through the back to the bit, this is a desirable effect of rounding the back. However a horse that is naturally predisposed to carrying himself in this position at rest will find it difficult to carry a rider comfortably and will lack elasticity in the topline, so making it hard to take this horse into a stretch outline without the horse going on to its forehand or producing resistance. These horses often buck into canter and find it difficult to maintain, due to lack of suppleness, they also have the propensity to shift the saddle forward into the leading edge of the scapula giving a restricted shoulder movement and setting the balance point more to the front of the horse.

Neutral backs; Horses' in general will spend most of their time in a neutral back position, that is a position which allows the horse to conserve energy by holding just enough tension in the ligamental system to hold his back level with no sag or rise to the spinal column. The abdominals work sufficiently to hold the stomach up without dropping but not enough to flex the lumbosacral joint, nor tip the pelvis toward collection. The neck is held at a slightly raised position but no tension or stretch is used to hold this position. This carriage is the most economical in energy use and is the best place for the horse to

effect a flight response quickly, as his back muscles remain elastic, his leg movement is free and some forward thrust is employed. A horse that has this type of back use will develop enough muscle to ensure that the fit of a saddle is comfortable and will allow the use of the back efficiently when a load is added (the rider). This offers the best back type to fit and achieve a stable fit of the saddle both in the static and dynamic portions of work.

Hollow backs; If a horse travels or stands in a hollow or inverted position, the back's spinal column will sag downward due to slack in the ligamental system combined with tight muscles of the longisimus and gluteus, allowing the belly to drop and the abdominal muscles to stretch. This carriage is both undesirable and difficult to fit a saddle to as there is no support system for the panel when the muscle sags, and the back can become sore or sensitive due to the tone and tension in the muscles because they contract as they drop. The horse then raises his head loosening the neck ligaments on top of the neck and uses the lower part of the neck, or foal system, to stabilize his carriage developing a dip at the front of the wither and a ewe neck with overdeveloped brachiocephalic and sternocephalic muscles in the lower neck. He then does not rotate the pelvis so the whole spinal connection will sag. The consequence of this carriage is either the development of small tears along the lower ligament beneath the spine and eventually Kissing Spines as the tops of the spinal processes rub together, or a very low back that is hard to ride on and gives a very up and down movement. Without a sustained lowering of the quarters, a horse can carry a high head and flex at the poll giving the appearance of being on the bridle whilst having no through carriage in the ligaments of the back. Another lesser problem associated with this form of carriage is that of the horse that is able to produce a raised back through the lumbar area but does not continue the relaxation of the back and allowing of the stretch over the wither, so though the connection is shown behind the saddle the trapezius thoracic is not raised and the through connection is halted in the saddle area, these horses often ride the saddle into the back of the scapula, making it hard for the fitter to maintain the saddle's position without it riding forward. Quite often these horses are fitted with a foregirth ostensively to stop the saddle riding forward, but as you can imagine this would put pressure on the area of the trapezius Thoracic and thus press it down more so this is actually making the problem worse not better. Point straps fixed to the tree point will help to alleviate this but should be combined with a self centering balance strap behind.

One issue I would like to address is that of the really strong forward step of some horses bred to compete, these horses are liable to push the saddle forward and into the shoulder not because of conformation issues but due to the breeding, a powerful hind mover that is not ridden well enough or is not strong enough to lift the shoulder in equal amounts to the hind thrust will experience saddle fitting problems from the type of movement. The solution to this is to develop the carrying capacity of the front to equal the back and no saddle will be stable until this is achieved.

Over use of the point and balance system is being seen (in anecdotal reports) especially when the conformation does not call for it, and this results in a constriction of the shoulder girdle and movement of the front leg, especially in an upward direction into a lighter forehand, only use this system when it is required due to instability in the saddle.

To conclude then, the fit of any saddle should be predisposed by the conformation and mechanics of the horse and an assessment of the horse, the rider and the movement is essential to developing the correct picture at any given point in the horses working life. It should be said that any change in work pattern, rider, or pain level/discomfort in the horse will induce an alteration in the saddle fit and ongoing problems of fit and structural changes should be referred to a Vet to assess the horse before continuing to work on the saddle issues.