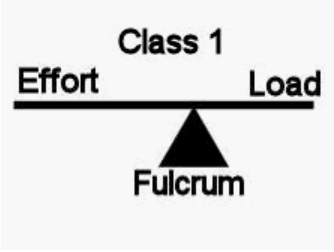
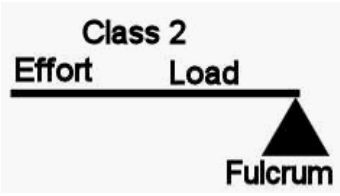
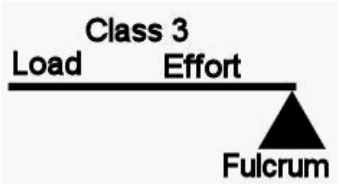
# ON THE IMPORTANCE OF LENGTH OF REIN

## Levers




I was reading the Conformation article on the club web site and came across the reference to the length of rein being an important consideration when inspecting a horse. The article then went on to say that a good length of rein confers balance to the horse to counter the power produced by the hind quarters. So far so good but there other factors involved where a good length of rein adds to the performance of the athletic racehorse.

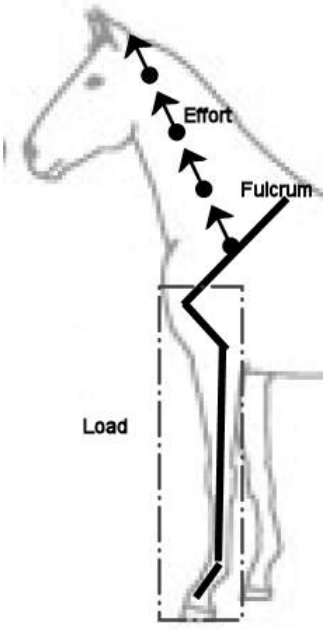
To fully understand why a good length of rein is important we must go back to basics : How does the horse move?
Locomotion requires the use of muscles, tendons and bones. These are arranged in a complex manner of levers and pulleys.
There are three classes of levers depending where the load, effort and fulcrum are located as in a seesaw, wheel barrow and BBQ tongs.

The reference to pulleys in horse locomotion is not your usual block and tackle but rather as a snatch block used to change direction of the force. The most obvious of these are the sesamoids which convert the upward pull of the flexor tendon to a backward pull on the hoof thus causing locomotion.

The locomotion muscles are the effort, the bone joints are the fulcrum and the bone itself and other bony attachments are the load..

The muscles are attached to the bone by tendons either close up or at a distance. The motive power is in the muscle.
Muscles work by contracting. Muscles are great at pulling, not much good at pushing.

There is a limit as to how much they can contract. The longer the muscle the greater the overall contraction. The bigger the muscle the more force it can deliver. This is the important property of the length of rein.
In essence the longer the length of rein, the greater the contracted length and thus the greater movement of the bone.




So back to the horse and in particular the front leg.
The front legs of a horse have no bone connection with the trunk.

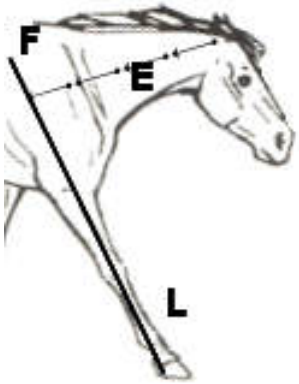
However the shoulder is firmly held in place by muscular attachments to the vertebrae, ribs etc. so for all intents and purposes we can say that the top of the shoulder can act like a fulcrum allowing rotation of the rest of the shoulder.

In the diagram opposite the attachment of the shoulder to the vertebrae is simplified. There is not just one muscle attachment but others running down the neck line. The arrow line represents the muscle and so becomes the effort.

Also for simplicity the humerus, forearm and so on down the leg represents the load for the lever. We can see that this system is a class 3 lever.

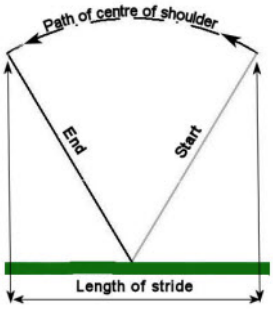
In the full gallop the horse's leading leg components undergo a series of flexions from one stride to the next. As the shoulder comes forward the flexions decrease until at the maximum forward motion of the shoulder the humerus has rotated somewhat and the lower limb takes on the aspect of a straight unit.

Having got so far it is time to simplify the diagrams again. Instead of the multiple array of bones for the load , these will be represented by one line only. After all we are only interested in the length of rein and what that represents.




The diagram on the immediate left now shows the position of the horse when the hoof touches the ground. Notice that with the head extending forward and the neck roughly parallel to the ground, the muscle is almost at right angles to the line of the shoulder. This is the most efficient angle for the transfer of power to the lever system.

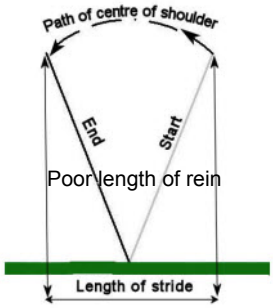
What we want to know how far the body travels before the hoof leaves the ground again. What happens is that the body rotates around the point of contact of the hoof so that the angle between the limb and the vertical on landing and departing are roughly the same as seen below. I say roughly because after the leg reaches the vertical,the muscles and tendon which comprise the flexion apparatus of the hoof come into play. This action provides the power impulse for the front leg. I have neglected the shock absorber effect of the flexor tendon here as this is outside the scope of this article.



*Good length of rein*

Now to the nub of the matter.
The adjacent schematics show the lever system of a good rein as opposed to the lever system of a short rein. Remember that the longer the muscle, the greater the contraction., the shorter the muscle the smaller the contraction.

A galloping horse with a good length of rein should have his leading hoof hitting the ground roughly below his nose. The angle between the ground and the leg approaches 45°.
The forward motion caused by the impulse from the hindquarters should rotate the shoulder around the point of contact of the hoof and the ground. This rotation continues the hoof leaves the ground. A period of suspension then follows until the other fore comes into play hitting the ground and the process repeated but in this case there is no suspension.




In the case with a horse with a poor rein, the mechanics of the stride are the same but because of the smaller rotation of the shoulder caused by a shorter muscle, the forward placement of the hoof is not as great. Thus the angle between the leg and the ground will be a lot greater than 45°, somewhat approaching 60° in this schematic. The nett result is that the length of stride is much depleted.

With all other points being equal, always choose a horse with a good length of rein.

Peter James