The Biomechanics of Turning a Horse
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What a boring topic. But the reality is, there is probably no one basic riding maneuver that causes as much controversy as how to turn a horse. In one hour of riding you will probably perform over 250 turns, not including circles. Doing this repetitive movement as correctly as possible can greatly benefit the horse’s performance and soundness.

Years ago an article in a horse training magazine asked three professionals, “How Do You Turn Your Horse?” Each description varied considerably and included the following:
1. Use the outside leg and inside rein
2. Use the inside leg and inside rein, and
3. Use the inside leg and outside rein.

On first glance, it seems that there could never be a consensus on the proper aids for turning. However, if we use some basic biomechanical and physics concepts we might be able to understand why all of these opinions might actually be correct.

Turns come in many shapes, sizes and speeds so there can never be only one set of aids that applies to all turns. In addition, horses can be very creative and can give a great variety of reactions over only a few strides. Therefore, you will almost always be switching from one set of aids to another as you move from the beginning to the end of a turn. And of course, the weight of the rider will also affect the balance of the horse through a turn, which will have to be the topic of another article.

Two of the important biomechanical concepts are the **forces that pull the horse inward** on a circle (centripetal) and the **forces that push the horse outward** on a circle (centrifugal). At speeds slower than the gallop, the forces that pull the horse to the center of the circle are the most predominant.

Let’s start by looking at what happens to the inside legs of the horse during the turn. Because of the relatively slow speed of the turn the horse is performing, the **strongest physical forces are the ones that pull the horse to the center of the circle**. For balance to overcome these forces that pull the horse inward, the **horse swings the inside front and hind legs a bit sideways, toward the center of the body**. (FIGURE 1) The center of gravity of the horse is located almost exactly behind the withers and about ½ way down the horse’s body directly under the spine. Horses instinctively try to always keep their legs as close as possible to the center of gravity of their body.
FIGURE 1
Common position for a turn
Inside legs swing toward the center of the body as the horse leans toward the turn
Outside legs are lifted slightly off the ground resulting in more weight being distributed on the inside two legs
The bend of the horse is away from the direction of the turn

In addition, not only will the horse change the swing of the legs to the center of the body, the horse will also lean to the inside to shift the center of gravity over the legs. (FIGURE 1) The horse should make the leg and body adjustments equally, but unfortunately, most horses will just lean into the turn. Swinging the legs toward the center of the body requires the horse to flex more in the joints, not something they usually prefer to do. This preference is similar to why people walk with relatively straight joints, rather than “duck walk” with bent joints, it’s easier. Of course, the horse can exaggerate the swing of the legs to the inside, just as the lean to the inside can be exaggerated. As an aside, the tendency of the horse to resist the (correct) inward swing of the legs is the reason we teach leg yield early in the horse’s training. As the speed of the horse increases, the lean of the horse to the inside, and hopefully the swing of the front legs to the center of the horse, will also increase. Most horses require some training to help them learn the best way to improve their balance without just leaning, especially because the additional weight of the rider makes it more difficult for the horses to stay correctly balanced.
Now let’s compare what happens with the outside legs of the horse during the turn. As the horse’s body leans into the circle, more weight is placed on the inside two legs. In this situation, the outside legs will be unweighted to a degree and will be lifted slightly off the ground. When this happens the outside legs will then be pushed toward the outside of the circle due to the inward lean of the horse. (FIGURE 1) The more the horse leans toward the center of the turn, the worse this tendency will be. Many times the horse will actually “squirt” to the outside of a turn because they are “skidding out” and not accepting weight equally onto the outside two legs. This “skid” reaction to the outside is more common when the bend of the horse is to the inside of the turn. (FIGURE 2)

FIGURE 2
Shallow turn - Inside rein and Inside leg
Excessive use of these aids or excessive reaction to the aids can result in the horse “skidding” to the outside of the turn

At this point, it becomes important to discuss the biomechanical concept of stability. A common example of stability is the table that has its total weight equally distributed between all four legs. To equally weight all four legs of the horse, we position the horse so that the outside front and hind legs are swinging toward the center of the body as the inside legs are, as seen in a well-performed canter pirouette. (FIGURE 3) Therefore, the excessive lean to the inside and resultant “squirt” to the outside of the horse during a turn will be reduced and the horse will have more stability.
FIGURE 3
The most balanced turn but also the most difficult
Inside and outside legs swing toward the center of the body as the horse leans slightly
toward the turn
The bend of the horse is toward the direction of the turn

We can now compare the use of the different aids listed at the beginning of the article and see how they could all be the correct aids for turning a horse.

Let’s start with the leg aids. For this discussion we will assume the horse has already been trained to move away from the pressure of the leg.

Outside leg: is the “tight-turning aid”. For example, if you were performing an eight-meter circle you would generally use mostly outside leg. (FIGURE 4)

Inside leg: is the “shallow-turning aid”. For example, if you were performing a 40-meter circle you would use mostly inside leg. (FIGURE 2)

The rein aids are a bit more complicated to define. First, for this discussion we will assume that the rein aid will not be so strong that it overcomes the leg aid. The second issue to keep in mind is that it is much easier for the horse to move away from the direction of bend than toward the direction of bend. For example, that is why we teach the leg yield before the half-pass. Third, the horse will tend to place more weight on the legs that are toward the direction of bend.
**Inside rein:** the horse would be looking in the direction of the turn. Generally, this makes it easier to push the horse to the outside of the circle. This bend will place more weight on the two inside legs making them more stable and less easy to move. (FIGURE 2)

**Outside rein:** the horse would be looking away from the direction of the turn. Generally, this makes it easier to push the horse to the inside of the turn. There will be more weight on the outside two legs with this bend. (FIGURE 4)

![FIGURE 4 Tight turn - Outside rein and Outside leg](image)

Now, for the practical application. If you want as tight a turn as possible, and it doesn’t matter what direction your horse is bent, you would want to consider the use of the outside leg and outside rein. (FIGURE 4) If you want to get as shallow a turn as possible keeping the horse always moving to the outside of the turn, you would use an inside leg and inside rein. (FIGURE 3) All other turns would be a combination of these two principles, with the most difficult turn being the one where the horse is required to keep both inside and outside legs moving toward the center of their body during the turn while maintaining an inside bend. (FIGURE 2) In addition, you have to take into consideration the multitude of inconsistencies the horse throws at you, such as a shy.
In summary, a turn does not typically require only one set of aids. Even a simple turn may require the rider to quickly shift between opposite sets aids. The reactions of the horse and rider must be a dynamic process, requiring constant evaluation of what has occurred and what is going to occur. That is why even after years and years of riding, we are always improving the quality of our circles and turns. As riders we understand that these movements are the basis of all the other exercises we do with our horses.