

Canter Rhythms, Oddities, and Illusions

When it comes to assessing canter rhythm, you can't always believe your eyes

By Hilary M. Clayton, BVMS, PhD, Diplomate ACVSMR, MRCVS

I'm sure you know that the canter is a three-beat gait. But it is less well known that, within the three-beat canter rhythm, there can be variations that affect our perception of the aesthetics of the horse's movement.

Let's start by reviewing the basics. In the canter, the footfalls of one diagonal pair are synchronized. The order of footfalls is: 1) trailing hind, 2) diagonal pair, and 3) leading foreleg. The rhythm of the canter is that of the three footfalls occurring as a triplet, followed by a longer interval (including the stance phase of the leading foreleg and the moment of suspension) before the first footfall of the next stride:

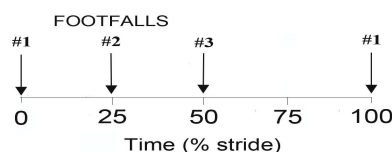
1 – 2 – 3 ----- 1 – 2 – 3 ----- 1 – 2 – 3

The suspension phase occurs at the end of the interval between the number-3 beat and the next number-1 beat. Typically it occupies only about 1 percent of the stride in collected canter and as much as 15 percent of the stride in extended canter. Consequently, the

interval between beat 3 and beat 1 is a little longer in extended canter.

When I measured the time between the three beats of canter in different horses, it became apparent that horses differ somewhat in their coordination patterns. Of course, the canter tempo and rhythm may be affected by things like the size of the horse and the degree of collection or extension. To minimize these effects, I'll describe the timing of the footfalls as percentages of the total stride time. The first beat marks the start (0 percent) and end (100 percent) of each stride. The second beat usually occurs close to 25 percent through the stride time, and the third beat occurs about halfway through the stride time.

If we put the footfalls on a time scale, it would look like this:



For a horse on the right lead, beat 1 is contact of the left hind, beat 2 is the simultaneous contacts of the right hind and left fore (the diagonal pair), and beat 3 is contact of the left fore. The suspension phase occurs just before 100 percent.

For the musically inclined, we can express the canter rhythm in 4/4 time as three beats followed by a rest:



In this notation, musical notes 1, 2, and 3 indicate the timing of the three footfalls. Note 4 is a rest, so it's silent. The rest occupies the time interval between the third beat of one canter stride and the first beat of the next canter stride.

Note that the canter rhythm is not equivalent to the musical rhythm of 3/4 time ("waltz time"), which would produce a series of three beats repeated at regular intervals but without the longer (rest) interval between beat 3 and the next beat 1. This explains why the canter is not a good fit with waltz music, which is in 3/4 time.



The musical staff above shows the rhythm of a waltz: with three notes spaced at equal time intervals, but without the longer interval between note 3 and the following note 1.

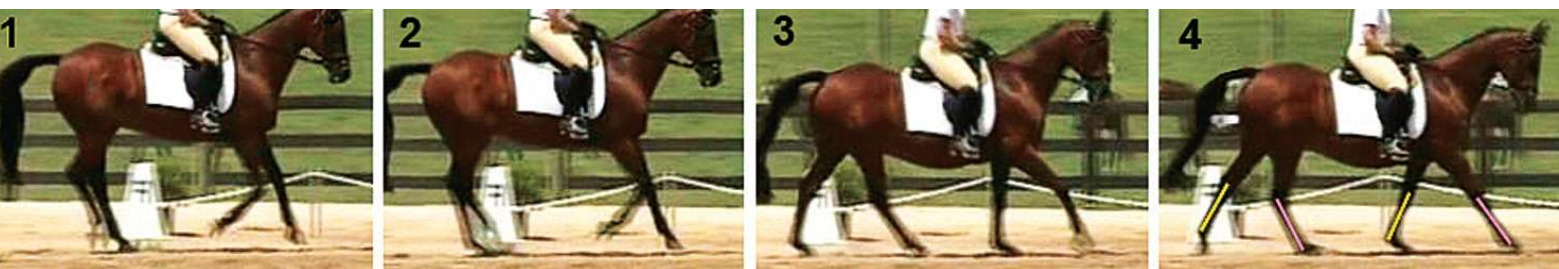


FIGURE 1. Video-still sequence of a horse with a lateral canter. The horse is on the right lead, and the photos show the footfalls. We would expect the diagonal pair (in this case, right hind and left fore) to contact the ground at the same moment, but here they are clearly separated, with the left fore contacting the ground earlier than the right hind.

Photo 1 shows the left-hind footfall. Note that the left forelimb is already well advanced and preparing to make contact with the ground.

Photo 2 shows the footfall of the left forelimb. At this moment the right hind limb is swinging forward and is superimposed on the left hind limb.

Photo 3 coincides with the right-hind footfall.

Photo 4 is taken at the moment of the right-fore footfall. This horse has all four hooves on the ground simultaneously, which is rather unusual; more often, the left hind has lifted off before the right fore makes contact. I've added colored lines to emphasize how the lateral pairs of limbs are moving in parallel. The left legs are shown in yellow, the right legs in pink.

The Four-Beat Canter (or Is It?)

A four-beat canter is one in which the footfalls of the diagonal pair occur separately. In other words, the diagonal footfalls are dissociated and the rhythm becomes impure.

My research suggests that when a canter adheres to the 0 percent-25 percent-50 percent footfall timings, it is aesthetically pleasing. When the footfalls—especially the third one—are delayed, the canter appears less harmonious. A delayed third beat tends to fool the eye into thinking that the horse is four-beating. In fact, after slowing down videos of horses that give the impression of having a four-beat canter, I almost always find that the rhythm is actually three-beat; the four-beat appearance is an optical illusion.

When a cantering horse looks or feels like he's four-beating, the rider needs to think about hastening the forward swing of the leading forelimb so that its footfall will occur earlier. The canter that looks four-beat often has footfall timings that look like the following diagram, with the third beat occurring after the midpoint (50 percent) of the stride:



This diagram shows the typical footfall timings for a horse that appears to be four-beating at canter but that actually has a three-beat rhythm. Note that beat 3 occurs after 50 percent of the stride—the real issue with the rhythm.

The Lateral Canter

The type of canter that really does show a four-beat rhythm is the “lateral” canter. This impurity is somewhat analogous to a lateral or “pacing” walk in that the fore and hind limbs on the same side of the horse's body swing forward more or less synchronously.



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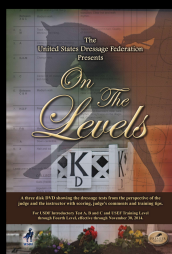
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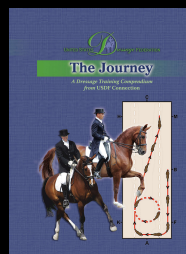
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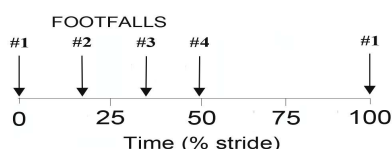
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The photos on page 26 are taken from a video of a horse with a lateral canter. The problem is initiated when the trailing forelimb leaves the ground too early, which precipitates its footfall. As a result, the diagonal footfalls are dissociated and the canter has a four-beat rhythm, with the front footfall occurring earlier.

The footfall timings of the horse shown in the photo sequence are as follows:



As the diagram shows, there are four distinct footfalls within 50 percent of the stride, and these footfalls are almost equally spaced in time. The interval between the second and third beats represents the diagonal dissociation, which is quite large in this horse. However, when we observe such a canter, our eyes find it easy to ignore

this type of four-beating, even though the lateral coordination of the limb movements is quite obvious.

Some horses have a natural tendency to move with a lateral rhythm in canter, but I have also seen horses that developed a lateral canter as the result of an external problem, such as an ill-fitting saddle that put pressure on the long back muscles. When the poorly fitting saddle was replaced with one that fit correctly, the canter reverted to a normal rhythm.

Interestingly, a lateral canter and its corresponding four-beat rhythm have the same footfall sequence as the walk. The horse in the photos in this article is on the right lead. Starting with the trailing (left) hind limb, the footfall sequence is left hind, left fore, right hind, right fore—same as it would be if he were walking.

It's difficult for our eyes to distinguish the individual footfalls of a cantering horse because they occur so quickly. After analyzing numerous slow-motion videos of cantering hors-

es, I've come to realize that the input from our eyes and the processing in our brains don't always lead us to correct conclusions about the rhythm of the canter. The lateral limb-coordination pattern is, however, easily recognized and is usually symptomatic of a four-beat rhythm that will be apparent if you look carefully at the movements in slow motion. On the other hand, the canter that we more often identify as "four-beating" often has a three-beat rhythm. ▲

Meet the Expert

Hilary Clayton, BVMS, PhD, Diplomate ACVSMR, MRCVS, is a world-renowned expert on equine bio-mechanics and conditioning. Since 1997, she has held the Mary Anne McPhail Dressage



Chair in Equine Sports Medicine at Michigan State University's College of Veterinary Medicine, East Lansing. The position focuses on dressage- and sport-horse-focused research. Dr. Clayton is a USDF gold, silver, and bronze medalist and a member of the US Equestrian Federation Dressage Committee.

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