

The Importance of “Collection” in the Ridden Horse

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This paper is an excerpt from the Collection chapter of my new book. In it we will take a look at “collection”—the ability of the horse to reposition its center of mass to more evenly balance its weight to all four legs. We’ll take a look at collection, how it is defined, what it means to the equine body, and why it seems so misunderstood. While I’m talking about dressage as the means for training the horse, I am not particularly married to dressage; in fact I am a rider who likes to ride across varying terrain, not arenas and competitions that are not “judged” by anything other than speed. On the other hand I have great respect for the dressage horses, trainers and riders who can perform that particular dance with seamless unity between horse, rider, science and art.

The lost art of training the riding horse

The early training of the riding horse was provoked by use of the horse for war. Originally horses were used to pull plows in the fields and then chariots for use in military operations. The high costs of chariots and all of their associated paraphernalia assured that only the rich would be able to afford them. (Today we can go to the tack shop and find our riding paraphernalia. But back in the day it required artisans to hand make each piece of equipment. Wheels took precious resources as well as the person with the knowledge to make them, leather had to be tanned and the animals slaughtered for their hide. The chariot was the Ferrari of its time.)

This expense associated with horse usage precluded its widespread usage confining it to those with enough wealth and leisure time to outfit and train it. This led to equating the horse with deities and the nobility, which carried over to the horse itself being seen as noble, unlike the donkey—the horse of the desert—which never really made the same impression. The only people who could afford the horse and the shining armor were the nobility. This same nobility could also afford the groom and the trainers for their horse, which allowed them to spend the time training the ridden horse to

perform in the same formations that the chariots used. The movements required for close formation cavalry battle required years of dedicated training. A philosophy for training was set out by the Greek Xenophon.¹ His treatise is still seen as one of the most useful and insightful writings on training the ridden horse. While at the same time it reflects the needs of humans more than it does those of the horse, I doubt that the horse sees itself as “...the horses upon which gods and heroes are depicted riding and men who manage them well will present a magnificent appearance...” The horse has and still suffers from the ego needs of humans.

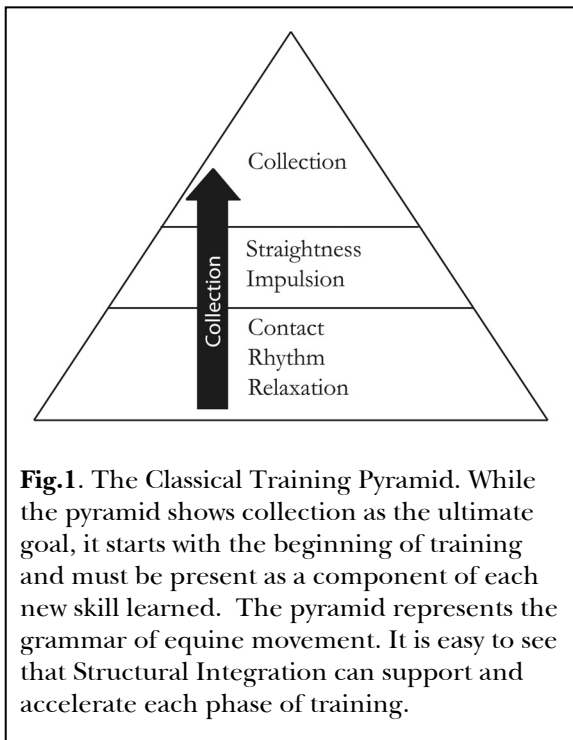
With the development of nation states and their national military—up until this time armies were made up of mercenaries paid to fight for the feudal lords, some of which were nobles—the need for a cavalry that could be quickly trained arose. The new citizen military required that the horse be trained in a standardized manner. This training standard allowed the cavalry rider to use any mount in their troop with the understanding that the horse was trained to respond to specific rider-provided aids—these are the cues from the rider’s legs, seat and hands - a refinement on “giddy up”.

Coincident with the schooling of the horse becoming more standardized, the riding horse became more easily available to the “common” person—this is a direct result of Napoleon’s changes in his cavalry where he used more “citizen” soldiers. The higher level of horse training—requiring years of work with the horse and only available to people with leisure time—was giving way to the requirement of simple functional transportation animals, this led to the development of the Haute Ecole (High School) riding in indoor arenas around the 15th Century, which is epitomized by the Spanish Riding Academy in Vienna, Austria. (The label “Spanish” refers to the Iberian bred horses that are used, not the philosophy of the school.)

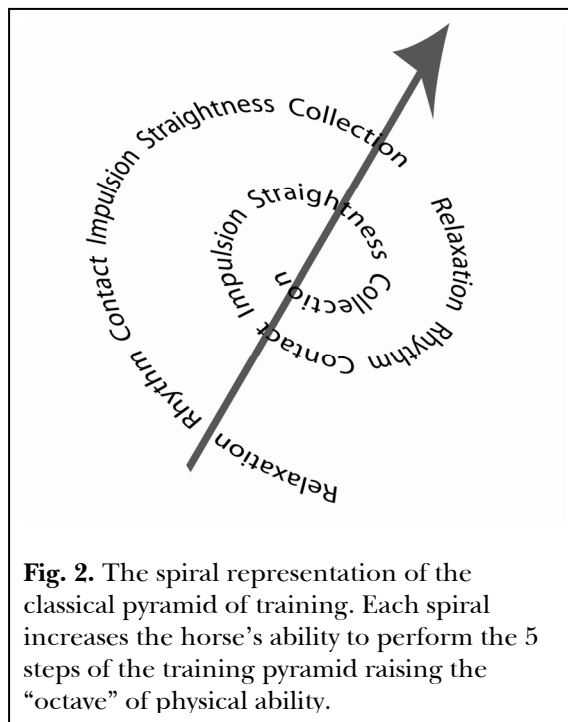
This long term view of training the horse produced a hierarchy of training steps or stages

that is known today as the “pyramid” of training. (Fig. 1) The pyramid of training has six steps and 3 phases. While it is presented as a linear progression it would be better to describe it as a spiraling (Fig. 2) of the steps, with each movement of the spiral indicating a higher level of organization in the horse’s body/mind. In other words each new learning task of the horse is only complete when all 6 steps are present. For example: a horse that is taught to trot a circle relaxed, in contact with the rider, engaging the rear with straightness and a light forehand, aka collected. Only in training this way is the horse able to move from one learning objective to the next with ease. It is in the support of these 6 steps that Structural Integration can play an important role, and it is in understanding these steps that the structural integrator can design a proper and beneficial intervention—therapy.

The misinterpretation that the steps are linear—with collection as the end result—rather than collective, has led to many horses being trained with the concept that once they have achieved one training step it doesn’t have to be re-introduced when more complicated movements are asked of the horse.



The final stage of the pyramid is Collection. In the Haute Ecole this equates to some very complicated arduous movements for the horse,



i.e. the Levade where the horse is on the rear legs only with the front legs flexed no more than 30 degrees.

In what follows, I will try to present a cogent argument as to why we structural body workers would want to assure that there is freedom in the shoulders to support the ridden horse in the pursuit of collection.

What is collection?

"The dressage horse must learn to engage the sling muscles to produce an uphill inclination. The muscles of this thoracic sling include the serratus ventralis and the pectoral muscles... When the sling muscles relax and lengthen, the rib cage hangs in a lower position between the shoulders. Consequently, the withers sink and the horse’s outline appears to be more downhill. When the sling muscles contract and shorten, the rib cage is lifted up, which raises the withers and gives the horse a more uphill inclination. Contraction of the sling muscles is a crucial piece of the mechanism of self carriage (collection) that transmits the elevating effect of the forelimbs from the shoulders via the sling muscles to the thorax and withers".²

A simple way to view collection is the ability of the horse to transfer weight to more evenly distribute it between all four legs. This means reducing the amount of weight normally carried by the forelegs—which usually support up to

sixty percent of the horse's weight—and shifting it to the rear legs. This is accomplished through a movement of the center of mass. When we add the weight of a rider and tack sitting primarily over the forelegs, this requires that the center of mass be shifted more towards the rear legs to redistribute the weight. This weight transfer is carried out through the movement of the center of mass of the horse towards the rear through lifting the thorax between the forelegs/shoulders.³ Are you reading balance with gravity? You should be!

A common error made in training the horse is the assumption that collection will come when an emphasis is put into developing the rear or “the engine”. It seems almost counter-intuitive that the ultimate key to the collected horse is the ability of the front of the body to lift—which requires free shoulders—and not the building up of a powerful rear end. This is especially hard to fathom when one hears or reads such things as: “collection is the rounding of the rear end” But as incredulous as it may seem this is actually the truth, the ridden horse cannot collect—at least to an acceptable level—without having shoulders that are free to allow the lifting of the thorax by the “sling” muscles: pectorals, serratus ventralis, subclavius, etc. The only way this lift can occur without compromising the ground contact of the horse's forelimbs, is to differentiate the shoulders from the thorax to allow a repositioning of the shoulders—scapula and humerus—vertically. Verticality of the shoulders is a mark or sign of



Fig. 3. This horse is moving “on the forehand” and “strung-out behind”. Notice that the right rear leg is contacting the ground before the front left—the forelegs have lost ground contact—and the right rear foot is hitting toe first.

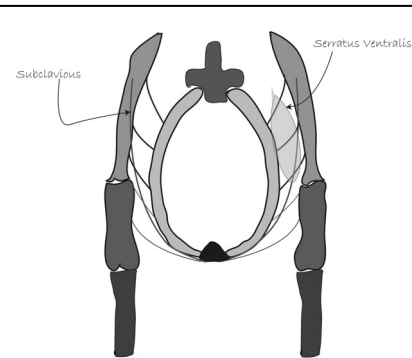


Fig. 4. The thoracic sling consists of the pectorals, the subclavius, and the serratus ventralis thoracis (SVT) muscles. As the pectorals, subclavius and the SVT contract they raise the thoracic “cage”, as a result the withers raise above the croup giving the horse an “uphill” posture, rear to front. The shape of the thorax—the thorax is ventrally larger than it is dorsally—requires the forelimbs to move laterally when it is raised.

originating on the thorax and attaching on the medial cranial border of the scapula. As these two muscles contract they are resisted by the serratus ventralis cervicis (SVC) as well as the rhomboids. (The SVT continues to the cervical vertebrae as the serratus ventralis cervicis and the rhomboid, both of which originate at the SVT's attachment point. It takes a scalpel to separate them.) (Fig. 4) The other sling muscles are the

quadruped, not just equine, Structural Integration.

If we follow the *build the engine and the front will follow* paradigm we end up with a horse that is able to push the center of mass from behind into a closed forehand, this is called “on the forehand”. (Fig. 3)

On the forehand: “An undesirable form of locomotion that involves the horse carrying an inappropriate proportion of its weight on its forequarter, a posture that runs counter to impulsion, collection and self-carriage. Usually seen in young or poorly schooled horses where the withers appear lower than the croup of the horse during locomotion.”⁴

The Anatomy of Collection

Before we get into a more detailed description of collection—or at least how the thorax rises—let me describe the “shape” change that occurs in the body from the thorax rising.

The thorax rising between the shoulders, or forelimbs if you prefer, is caused by the contraction of the subclavian muscle—yes it is true that the horse does not have a clavicle, so this is a misnomer, but none the less that's its name—originating at the sternum and attaching at the cranial border of the scapula and the serratus ventralis thoracis (SVT)



Fig. 5. The horse on the right, threatened with a kick, telescopes his neck to show his dominance while shifting his weight towards the rear.

pectorals, of which there are three, all originating on the sternum and attaching to the humerus. During the first part of retraction of the forelimb, the latissimus dorsi brings the leg back, as the leg enters the stance phase of retraction, the pectorals propel the thorax forward and dorsally—very similar to the way your spring loaded rocking horse behaves. The dorsal translation of the thorax raises the withers as well as the sternum. Some estimates have a collected 16 hand horse growing to 16.1 hands or an increase of one inch in height. (Fig. 5)

How Rear End Rounding Occurs

With the withers raising from the contraction of the sling muscles, the longissimus dorsi—I would suggest it is all of the erector group that contributes to this and not just this one muscle—attachment at the withers comes up and caudally, allowing the pelvis to move caudally and ventrally, rounding the rear while bringing the acetabulum cranially, allowing the leg to reach further under the horse. This rounding of the rear is further assisted by the pull of the rectus abdominus on the pubic bone which occurs when the sternum rises—the rectus attaches at the pubic bone and the sternum. Additionally, the raising of the withers raises the 7th cervical vertebrae assisted by the actions of the scalenes which causes the base of the neck to raise and the cervicals to “telescope”. Neck telescoping is an important part of collection.

The misunderstood message of collection has occurred, in my mind, when riders and trainers have taken the visual of the rounded rear to indicate a collected horse—with no

A person pushing a wheelbarrow with a flat tire has to work harder. The hamstrings get larger and the foot stays on the ground longer getting “strong out behind” the vertical.

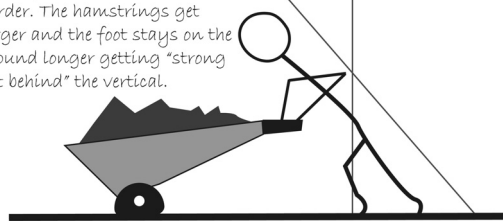


Fig. 6. Like a person pushing a wheel barrow with a flat tire a horse with a restricted front end has to push harder with the rear end muscles. This causes overuse of the hamstrings as well as a reduction in spinal flexion/extension.

regard for shoulder freedom or front end lightness/COM translation. Without the shoulder being free from the thorax the rounded rear doesn’t indicate collection, it only indicates pushing into a heavy forehead. This is similar to person pushing a wheelbarrow with a flat tire. (Fig. 6)

The horse that is ridden in this way will have the potential for:

1. Overly developed hamstrings—especially the biceps femoris which has to overcome the reciprocal apparatus of the rear leg. This comes from pushing into a restricted front end—like a wheel barrow with a flat tire.
2. A neck that is not raising at the base, with a potential towards a neck which is concave ventrally—ewe neck—that is caused by trying to accommodate the need for longissimus length along the top line through raising the head.
3. Shortened hypertonic scalenes—the scalenes are tonic muscles.
4. An AO joint which is restricted and stuck in extension—this further restricts the hamstring length.
5. A hollow back with lumbar flexion and possibly pain.
6. A subluxed sacrum—this is also called a hunters bump from the propensity horses that jump have in developing this problem—from the push of the hamstrings into the closed front end and an increased pull on the lumbar fascia.
7. Hypertonic shoulder stabilizers, mostly the lateral ones.



Fig. 7. This is the horse we saw earlier, only standing. The black wave—sinusoidal in this illustration—represents the GRF which starts with the foot contacting the ground on retraction and ends when the foot leaves the ground. The red wave is representative of the soft tissue wave that comes from the rear due to the motion of the pelvis musculature. When these waves are able to move freely through the body they leave through the production of a “pendulum” movement of around the AO—the common “nodding” motion we see in a free moving horse. If they are not able to leave—restricted shoulders would cause this—they are reflected and create “standing waves”. The alternating green/red areas indicate hypertonic green and hypotonic red areas. Freedom of the shoulders—collection—allows these waves of energy to move through the body freely.

Why is collection important?

Because the horse naturally carries the greater percentage of its body weight over the front limbs, the addition of rider and tack increases the burden on the forelimb structures. For the backyard horse helping them to balance this weight is enough of a reason for freeing the shoulders. Collection is paramount for the horse that is used for any upper level riding discipline from Dressage to Barrel Racing where being light on the forehand is a requirement.

Beyond this there is a negative effect on the rear end of the horse from reflected “waves” of kinetic energy from the ground reaction force and the movement of the soft tissue. This was discussed in detail in my book *Equine Structural Integration: Myofascial Release Manual*, and in many articles I’ve written so I won’t go over it in detail here. (There are further discussions, articles and animations of this on the www.animalsi.com website.)

There are two waves of energy which move through the spine and soft tissue of the quadruped as a result of locomotion. One of these is the Ground Reaction Force (GRF) which is transformed from a linear force to a rectilinear force by the legs—the legs act like a wheel in that they take the GRF’s vertical impulse and translate it into moving the center of mass horizontally. The other wave is a soft tissue one, which corresponds to the pelvic movement. (Fig. 7)

How erroneous ideas about collection spread

A false conclusion, once arrived at and widely accepted is not dislodged easily, and the less it is understood, the more tenaciously it is held.

- Cantor’s Law of Preservation of Ignorance

Politicians have learned that all one has to do is repeat a message over and over again and it will eventually be accepted by the public as the truth. If the message being pushed is a seeming simplification of a more complicated one then it will be more readily accepted. Unfortunately, I believe, this is what has happened in the United States when one discusses collection—I’m singling out the US since there is no standardized training of riders, riding instructors, or horse trainers as there is in many European countries, and as such there is no standardization of terms. The concept of collection has been watered down to: engage the rear, round the rump, step under from behind... All of these are valid descriptions of a part of the mechanics and body shapes that a collected



Fig. 8. While this horse looks fit, the soft tissue is out of balance. The rear is overly developed relative to the neck. This is a sign of restricted shoulders—the neck is small because the energy of the GRF and pelvic rotations is not flowing to the head. The lateral stabilizers of the shoulders are hypertonic and not able to bring the scapulae laterally. This causes the forefoot to cross the mid-line as the pectorals contract

horse has, but to true collection, they are like mistaking a reflection of the moon in a pond as the moon itself.

2207 studies of the mechanics of collection were carried out by Dr. Hillary Clayton using upper level dressage horses and riders—upper level means the horse is able to perform movements that require it to transfer weight to the rear.⁵ In the study, force plates were used to determine the amount of weight carried by each foot. The study showed that collection started with a lift from the thoracic “sling” muscles which allowed the rear of the horse to come

under —what was called being uphill—flexing the hind limb “springs”. It is now up to horse people to study these findings and spread the word about true collection.

Conclusion

Horses in their natural movement have some degree of collection that is readily available to them. They also have the freedom of their body, unhindered by riders and riding norms, to shift their body shapes to accommodate a need to redistribute their center of mass.



Fig. 9



Fig. 10

Fig. 9. Here is a horse at liberty—unencumbered by tack or rider and moving freely. (This is my horse; he has had over a hundred sessions of Structural Integration from either me or people attending my course.) He is galloping in a pasture. The white line and arrow indicates the rounding of the rear which is accommodated by the top line length. The black arrow points to the shoulders, which are vertical and the withers which have risen between the shoulders. The two red arrows indicate the base of the neck which is raised and the sternum which has also risen. The rounding of the rear with the raising of the withers creates an “uphill” posture, when viewed caudally to cranially. As the rear leg is retracted the spring system will be loaded, the rear foot will be stabilized by the ground, the ground reaction force travels up the leg along the spine and out the head—this is the cause of the head nodding. The rotation of the pelvis creates a push-pull on the soft tissue of the back, it also loads the lumbar spring system. All of these “waves” have to be able to move out of the body without the restriction of the shoulders.

Fig. 10. Same horse later in the coming to a stop at the gallop. Notice how much the weight is being shifted to the rear legs to accommodate the stop. You can see the eccentric contraction of the tensor fascia latae. The neck has been elevated even more from the base to shift the COM to the rear. The shoulders are vertical which allows the withers to rise even though the forelegs are not in contact with the ground. Look closely at the elbow and you can see the space between it and the thorax, this is an indication of the shoulder verticality.

Credits:

Illustrations 1, 3, 4 and 6 are by Jim Pascucci.

Photos 3, 8, and 7 are by Stacey Kollman/Desert Horse Equestrian Services with the modifications to 7 by Jim Pascucci.

Photos 5, 9 and 10, are by Nick Pascucci modified by Jim Pascucci.

Endnotes

¹ Xenophon translated by Dakyns, Henry Graham, On Horsemanship, Gutenberg Project, 1998.

² Dr. Hillary Clayton, "Components of Collection." Dressage Today, October 2007:42:48.

³ Research Staff, "The Mechanics of Collection and Self Carriage." 2007 McPhail Research Report: 8.

⁴ Sue McDonnell, Horse Behavior: The Equid Ethogram, Lexington, Eclipse Press 2003.

⁵ Willem Back and Hilary M. Clayton Equine Locomotion, London, WB Saunders, 2000.