

Biomechanics of the Movements

Conclusion of three parts on biomechanics in the USDF "L" program

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SCIENTIFIC METHOD: Biomechanics research shows that some movements, including canter pirouettes, happen differently than the rules describe. Pictured: Kathy Adams and her Dutch gelding Lion (Concorde x Sultan).

IN THE PAST TWO ISSUES, I HAVE OUTLINED the "L" Education Program's teachings of equine biomechanical principles and the biomechanics of the three gaits. In this article, I will end my series with a look at the biomechanics of dressage movements. I'll finish with a discussion of the application of biomechanical principles to dressage judging.

Movements Defined

"Movement" includes three separate issues. According to USDF's Glossary of Judging Terms:

Movement: The manner in which the horse moves over the ground (this includes freedom and regularity; see last month's "Judge's Box" for explanations of the latter terms).

Test movement: A section of a dressage test to be evaluated with one score on the score sheet.

Dressage movement: An exercise as opposed to a figure, a pattern, a transition, or some combination thereof. Dressage movements are leg-yield, shoulder-in, rein back, travers, renvers, half-pass at trot and canter, flying changes, pirouettes, turns on the haunches, piaffe, and passage.

How Judges Evaluate Movements

In the "L" program, we address the first issue (movement of the horse) in the section on general biomechanics and mechanics of the gaits. We address the second and third issues (test movements, including figures, patterns, transitions, and combinations; and dressage movements) in the section on biomechanics of the movements.

When we evaluate the test movements and dressage movements, we first determine whether the horse has performed the required task; then we evaluate the biomechanics (basics) of the performed task.

To evaluate the task, we address the "what"—the descriptions and components specific to each movement. In leg-yield, for example, the judge looks for the following:

- Alignment of the horse's body parts (straight, not twisted at the base of the neck)
- Parallelism of the horse's body to the line of reference (in our tests, the long side of the arena)
- Sideways progression along the appropriate line of travel.

Then the judge addresses the "how"—the biomechanics and the basics. In a leg-yield to the right, away from the rider's left leg, the judge evaluates the following:

- Do the leading (right) legs step forward enough, or are they merely falling sideways (abducting) in order to accomplish sideways progress?
- Do the trailing (left) legs step forward toward and under the horse's midline, or are they mainly pushing to the left?
- Do the legs leave the ground when they are near the vertical, or are they angled while the hoof is still grounded (sprawling, on the forehand)?
- Is the horse in self-carriage, or is he being mauled into "creating the look"?

We also address "common faults in performance" in the various movements. This approach can be used to assess any dressage movement or test movement, in terms of both task and basics (biomechanics).

Science, Not Faith

A little basic biomechanical knowledge about the dressage movements helps us to recognize whether an exercise is performed correctly and whether it is done well. It also helps us to recognize when an exercise is described or perceived incorrectly. Most of us have heard exercises described in certain ways all our riding lives. Familiarity has led us to the "ah syndrome"—the tendency to nod sagely in agreement in the face of any amount of nonsense. Einstein said, "A foolish faith in authority is the worst enemy of truth." Familiarity with biomechanics allows us to avoid operating on faith in authority and allows us to operate from knowledge.

Despite solid evidence of biomechanical inaccuracy, examples of "faith in authority" and the "ah syndrome" persist in both the FEI dressage rules and our own national rules. For instance, the passage has long been described as having a prolonged phase of suspension, when

THE JUDGE'S BOX

IS THE HORSE ON THE BIT?

The judge looks at: The horse's neck, head, and outline

The judge looks for: Stretched convex topline (distance from withers to poll along the crest; no broken neckline or dropped poll); the complexus musculature (delineated from jaw to shoulder; pulsing and "alive"); concavity of the underline of the neck (not bulging); the front line of the face at or slightly in front of the vertical.

IS THE HORSE STRAIGHT?

The judge looks at: The horse's spine and the line of travel

The judge looks for: An aligned spine; parallelism to line of travel (no lateral deviation of forehead or haunches); directness of line of travel (accuracy; no drifting or weaving).

ARE THE GAITS PURE?

The judge looks at: The footfalls

The judge looks for: Correct sequence and spacing of footfalls; evenness of timing of

footfalls; simultaneity of footfalls of diagonal pairs in trot and canter.

ARE THE GAITS OF GOOD QUALITY AND IN BALANCE?

The judge looks at: The legs and footfalls

The judge looks for: The hoof to leave the ground soon after the cannon bone becomes vertical (mid-stance phase) in trot and canter; the hind foot to reach as far forward of the hip as it is behind the hip when the hoof is lifted; the joints of the hind legs to bend when each leg is grounded (engagement) and lifted (hock action).

MOVEMENT EVALUATION: CIRCLE

The judge looks at: The horse's outer side and inner side; placement of footfalls

The judge looks for: Stretched and lengthened outer side, not just a contracted inner side; flexion in the throatlatch and poll; adduction and reach of the outer foreleg in the direction of the turn; adduction of the inner hind leg forward toward the horse's midline; straightforward steps of the inner foreleg and the outer hind leg.

MOVEMENT EVALUATION: HALF-PASS

The judge looks at: The horse's body position relative to the arena; the horse's neck and legs

The judge looks for: The horse's body position relative to the arena; that the horse is nearly parallel to the long side of the arena (line of reference), with the forehead slightly leading; the outside of the neck is stretched long; the angle between the skull or the side of the cheek and the side of the neck at the throatlatch; no leg extends very far out from under the body (neither backward nor sideways); hooves are lifted when the legs are nearly vertical (outer hind leg not angled while still grounded); adduction of outer legs.

These are just a few examples that show how judges in the "L" program evaluate the various aspects of gaits and movements. If we do not operate in this way, it is easy to be distracted by extraneous issues, to be fooled by "flashy," or to be inconsistent in addressing issues. Judges and trainers' understanding of basics and biomechanics defends dressage against artificialness and succumbing to trends and also improves communication.

For those who would like to learn more about biomechanics than we have time to offer in the "L" program, I suggest the books and lectures of McPhail Dressage Chair Dr. Hilary Clayton.

For the Good of the Sport and the Horse

By understanding how the horse operates as a machine (general equine biomechanics and mechanics of the gaits) as well as the mechanics of the movements, we learn about how to judge more knowledgeably. Most important, we learn about how to make horses go better and how to make their lives better, as we ask them to bend to our will. ▲

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