



A routine part of Thoroughbred care is soundness exams. Observing how the limbs function at different gaits is paramount to addressing any issues in the early stages of a potential injury

Making Strides

RESEARCH CONTINUES TO ADVANCE ON A CRUCIAL TOPIC

By AMANDA DUCKWORTH

LAMENESS, WHICH PRESENTS as an abnormal gait or stance, is a common but frustrating issue when it comes to horses. There is no singular reason why a horse may go lame, and it can be an indicator of a number of different conditions. It affects all ages and all breeds, but research and technology continue to advance the cause of early diagnosis.

When a horse appears lame, it is important to work with a trusted veterinarian to create treatment plans. The American Association of Equine Practitioners provides a presentation

on lameness on its website for owners to help further education.

“Stress, strain or injury can take a toll on any horse, even one without obvious conformation defects,” explains the AAEP. “When lameness occurs, contact your veterinarian immediately. A prompt examination can save you time, money, and frustration by diagnosing and treating the problem immediately, possibly preventing further damage.”

In the United States, the vast majority of veterinarians work with a 5-point scale from the AAEP to describe lameness.

- 0:** Lameness not perceptible under any circumstances.
- 1:** Lameness is difficult to observe and is not consistently apparent, regardless of circumstances (e.g., under saddle, circling, inclines, hard surface, etc.).
- 2:** Lameness is difficult to observe at a walk or when trotting in a straight line but consistently apparent under certain circumstances (e.g., weight-carrying, circling, inclines, hard surface, etc.).
- 3:** Lameness is consistently observable at a trot under all circumstances.
- 4:** Lameness is obvious at a walk.
- 5:** Lameness produces minimal weight-bearing in motion and/or at rest or a complete inability to move.

Because of the varying nature of lameness, subjectiveness is inevitably a part of the process. However, research is continually done in this field as experts strive to understand lameness better and diagnosis it earlier.

JOCKEY CLUB OF SAUDI ARABIA/MATHEA KELLEY

In August 2026, *Animals* published “Serum Osteocalcin and CTX-I in Fit-to-Race Thoroughbred Racehorses: Reference Intervals and Associations with Demographic, Training, and Lameness-Related Factors.”

“Racehorses can develop bone and limb problems during training before obvious signs of injury are seen,” explained researchers. “Detecting horses at lower or higher short-term risk could help trainers and veterinarians make safer decisions and improve horse welfare. This study examined whether two simple blood tests that reflect bone activity could help assess soundness risk in Thoroughbred racehorses in active training.”

The study, which was conducted in

Australia, took blood samples from 1,359 fit-to-race horses, and they were tested for osteocalcin, which is a marker linked with new bone formation, and C-terminal telopeptide of type I collagen, which is a marker linked with bone breakdown and repair. This was done as part of a collaborative Racing Australia bone health surveillance program.

“Osteocalcin was higher in horses that were lame at the time of sampling and was also associated with short-term lameness over the following seven and 28 days,” researchers concluded. “A low osteocalcin result was linked to a lower likelihood of persistent lameness, although this link weakened once other factors such as age, sex, and training

conditions were taken into account. The second marker varied strongly between locations and training surfaces but did not predict lameness.

“These findings suggest osteocalcin is a promising marker for further scientific research into soundness risk in this population, although its clinical usefulness has not yet been established.”

Movement throughout a horse’s body can play an important role when diagnosing lameness. In January 2024, *Equine Veterinary Journal* published “Withers vertical movement symmetry is useful for locating the primary lame limb in naturally occurring lameness.”

“During orthopedic assessment of lame horses, a head nod is commonly

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Lameness



Above,
A veterinarian
conducting a
flexion test

Right, Rood &
Riddle Equine
Hospital's
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tomography
scanner at its
Lexington hospital
is used for
diagnostic
imaging in some
lameness cases



present in both primary forelimb and hindlimb lame horses,” explained researchers. “Additional motion metrics that could assist clinicians in correctly differentiating between these two scenarios would be of great clinical value.”

The objective of the retrospective study was to examine whether withers movement asymmetry can be used in a clinical setting to distinguish primary forelimb lameness from compensatory head movement asymmetry due to

primary hindlimb lameness.

For the study, researchers measured the movement asymmetry of the head, withers, and pelvis using multi-camera optical motion capture. This was done as part of routine lameness investigations at four European equine hospitals, and 317 horses were studied.

“In forelimb lame horses, 80%-81% showed head and withers asymmetry both indicating lameness in the same forelimb,” researchers concluded.

“In hindlimb lame horses, 69%-72% showed head asymmetry ipsilateral to the lame hindlimb and withers asymmetry diagonal to the lame hindlimb, thus, head and withers asymmetry indicated lameness in different forelimbs. A large compensatory head nod was seen in 28%-31% of the hindlimb lame horses. In 89%-92% of these, head and withers asymmetry indicated lameness in different forelimbs. Withers asymmetry decreased linearly with reduced head or pelvic asymmetry for both forelimb and hindlimb lame horses.

“Withers vertical movement asymmetry metrics can be useful in helping to locate the primary lame limb during quantitative lameness assessment. Head and withers movement asymmetry parameters generally indicate the same forelimb in forelimb lame horses, but different forelimbs in hindlimb lame horses.”

In March 2025, Equine Veterinary Journal published “Vertical pelvic movement asymmetry and lameness location in ipsilateral combined forelimb and hindlimb lameness cases.”

“Compensatory vertical head and pelvis movement asymmetry may occur in trotting horses with a primary cause of lameness in one end of the body due to the weight shifting between limbs, leading to apparent combined forelimb and hindlimb lameness (CFHL),” explained researchers. “Little is known about CFHL patterns observed with body-mounted inertial sensors (BMIS) and regardless of their underlying mechanisms, compensatory and secondary lameness may complicate the definitive identification of the primary causes of lameness.”

For the retrospective cohort study, researchers aimed to determine associations between vertical pelvic movement asymmetry and location of primary lameness in ipsilateral CFHL cases where hindlimb lameness is solely of the impact or push-off type.



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Withers displacement when a horse is at the trot and moving in a straight line can be an indication of lameness

Researchers identified cases suitable for the study and categorized them by lameness location of the limb(s), diagnosis, and ratio of the amplitude of forelimb to hindlimb lameness ($\text{Fore}_a/\text{Hind}_a$).

“Among the 2,375 total lameness cases screened, 49 IpI and 36 IpP cases met the criteria for consistency, low variability, and definitive diagnosis. IpI cases were more likely than IpP cases to have forelimb-only lameness causes when $\text{Fore}_a/\text{Hind}_a > 1$,” researchers concluded. “IpP cases were more likely than IpI cases to have hindlimb-only causes at both $\text{Fore}_a/\text{Hind}_a > 1.0$. Compared with IpI, IpP cases were more frequently diagnosed with tendon, suspensory ligament, or high-motion joint disorders in hindlimbs and less with unknown causes. In IpI cases, positive forelimb regional anesthesia often reduced hindlimb lameness, whereas in IpP cases, positive hindlimb regional anesthesia typically lessened forelimb lameness.

“The type of pelvic movement asymmetry observed in IpI and IpP cases is linked to the location and underlying cause of the primary lameness.”



LAMENESS EVALUATIONS ARE A CRUCIAL ASPECT OF EQUINE VETERINARY PRACTICE, WITH THEIR PREVALENCE INCREASING STEADILY EACH YEAR. TYPICALLY, THESE EVALUATIONS ARE CONDUCTED VISUALLY, WITH VETERINARIANS OBSERVING THE HORSE'S MOVEMENT. HOWEVER, THIS METHOD IS INHERENTLY SUBJECTIVE AND PARTICULARLY DIFFICULT WHEN ASSESSING HORSES WITH MILD LAMENESS.”

—SENSORS (BASEL),
FEBRUARY 2025

Researchers did note that most of the included cases were Quarter Horses, so results may differ in other breeds.

Retrospective studies often help researchers glean new information from data that has already been collected. In May 2025 the Brazilian Journal of Veterinary Medicine published “Objective lameness assessment of 235 horses undergoing lameness examination in Brazil: A retrospective study.”

Researchers investigated the lameness patterns of horses that underwent lameness exams or monitoring from 2016 to 2020 by using data from those exams. It included clinical history, static inspection, palpation, gait evaluation, flexion tests, lunging examination, diagnostic anesthetic blocks, and imaging exams.

“Of the 235 animals included in this study, 93.6% presented lameness,” explained researchers. “Of the animals with lameness, 59.5% had forelimb lameness and 40.5% had hindlimb lameness. The most frequent lameness condition was primary lameness in one limb and secondary lameness in the other. Impact lameness was the most frequent type in both the forelimb and hindlimb. Moderate-to-severe lameness was the most frequent level of intensity. Regarding the lameness location, in the forelimb, the distal region was the most affected, while in the hindlimb, the proximal lower region was the most affected.

“Lameness primarily affects the forelimbs, with primary forelimb lameness and secondary hindlimb lameness being the most common condition. Compensatory lameness often occurs in the hindlimb opposite to the affected forelimb. Impact lameness is the most common primary lameness, typically of moderate to severe intensity, in both the fore- and hindlimbs. Forelimb lameness is mostly distal (pastern and hoof), whereas hindlimb lameness is most frequent in the mid-proximal region (tarsus).”

THIS PAGE: FABIG-TIPTON PHOTOS; OPPOSITE PAGE: ALEXANDER BARKOFF

Diagnosing lameness remains a subjective exercise, but technology is always evolving. While technological advances can help in many ways, research has also shown to use some caution in that approach. In February 2025, Sensors (Basel) published “Discrimination of the Lamé Limb in Horses Using a Machine Learning Method (Support Vector Machine) Based on Asymmetry Indices Measured by the EQUISYM System.”

“Lameness evaluations are a crucial aspect of equine veterinary practice, with their prevalence increasing steadily each year,” explained researchers. “Typically, these evaluations are conducted visually, with veterinarians observing the horse’s movement. However, this method is inherently subjective and particularly difficult when assessing



The majority of veterinarians in the United States use a scale method to rank the severity of lameness at the walk and trot



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horses with mild lameness. Moreover, there is a notable disparity in the ability to detect an asymmetrical movement between experienced and inexperienced practitioners.

“Given that detecting lameness can already be challenging for a veterinarian, it becomes even more difficult for an amateur rider. However, early detection of any locomotor abnormality is crucial for animal welfare and preventive care.”

“The study highlighted the importance of specific variables, such as vertical head and withers displacement, for accurate classification. Future research should focus on refining the model, exploring deep learning methods, and reducing the number of sensors required, with the goal of integrating these systems into equestrian equipment for early detection of locomotor issues.”

In January 2025, Equine Veterinary

IMU systems; a markerless AI system; and subjective evaluation of horses trotted in a straight line under field conditions.”

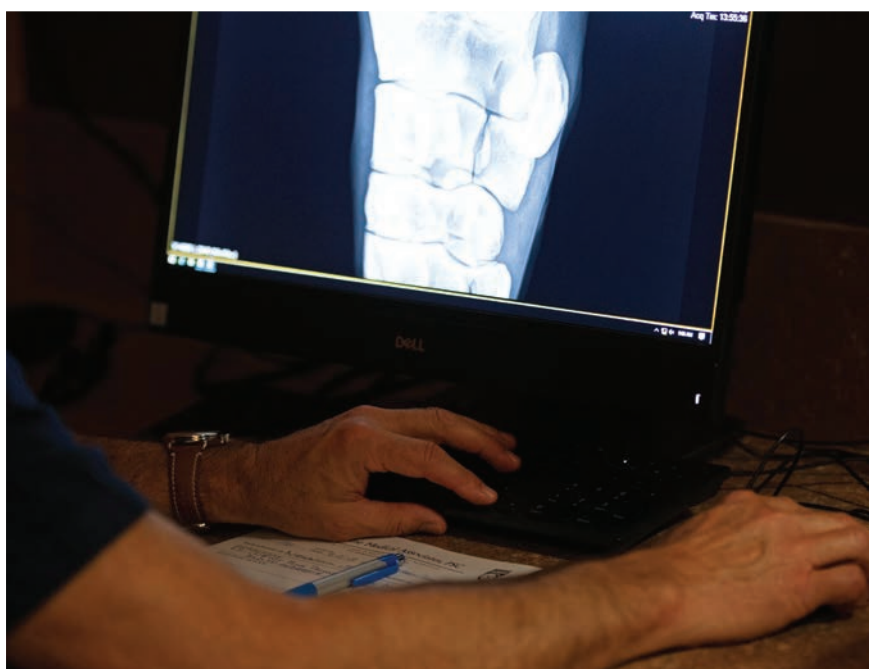
A total of 52 client-owned horses were recruited for the descriptive clinical study. Of those, nine were riding school horses, 17 were competing in equitation sports, and 26 were from harness trotting racing yards. To be eligible for the study, a horse had to be in normal training or use. In all, data from 41 of the horses was included in the results. Comparisons were made between a markerless AI system (SL); the Equinosis Q Lameness Locator (LL); the EquiMoves (EM); and subjective evaluation (SE).

“The three objective systems were comparable in classification of asymmetric limbs under field conditions as assessed by the agreement analysis applying commonly used asymmetry thresholds for these systems, and discrepancies stemmed largely from the imposed thresholds (i.e., systems largely identified same-side asymmetry),” researchers concluded. “Also, acceptable agreement was found between the different objective systems when looking at normalized asymmetry data, although overall agreement was highest between the two IMU systems. The fewer hindlimb strides analyzed with the SL could represent a limitation of the Sleip AI®.

“The results from this study emphasize the importance of being familiar with the particularities of the systems in clinical use. Careful familiarization with objective asymmetry evaluation systems and data interpretation including number of strides available for analysis and asymmetry parameters including standard deviations, are recommended when using objective systems regardless of the technology implemented to avoid erroneous clinical interpretation.”

While the cause of lameness can vary wildly, research in this field continues to progress, as everyone understands that the earlier a horse can be diagnosed and treated, the better for all of those involved. **BH**

ANNE M. EBERHARDT



X-rays are in order when a horse presents with lameness that can't be explained by other means

For the study, 287 horses were included. Of those, 256 showed single-limb lameness and 31 were classified as sound. Researchers aimed to create a predictive system using a support vector machine (SVM) to identify the affected limb in horses trotting in a straight line.

“The model achieved an overall accuracy of 86%, with the highest success rates in identifying right and left forelimb lameness,” researchers concluded. “However, there were challenges in identifying sound horses, with a 54.8% accuracy rate, and misclassification between forelimb and hindlimb lameness occurred in some cases.

Journal published “Objective movement asymmetry in horses is comparable between markerless technology and sensor-based systems.”

“A markerless artificial intelligence (AI) system for lameness detection has recently become available but has not been extensively compared with commonly used inertial measurement unit (IMU) systems for detecting asymmetry under field conditions,” explained researchers. “The aim of the current study was to compare classification of asymmetric limbs after imposing asymmetry thresholds, and comparison of normalized asymmetry data using two different

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