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Normal and abnormal equine posture: how PRI can help performance and health

By Karen Gellman, DVM, PhD - April 2, 2015



Why should we care about posture in horses? Because it informs us about how their complex neuro-musculoskeletal system is functioning. Recognizing abnormal compensatory postures as a cause of multiple neurological, muscular and behavior problems is key to improving equine health.

Horses can be returned to normal neutral posture (and maximum performance!) by using Postural Rehabilitation Intervention, a manual therapy to restore correct responses in the upper cervical righting mechanisms, and accurate balancing of hoof proportions and dental occlusion.

Maximum Horsepower Research's recent study, funded by the American Holistic Veterinary Medical Foundation, proposed that an optimal neutral posture exists for all animals. Preliminary results from the study have shown a clear relationship between posture and "cost of stance". Abnormal compensatory postures (ACP) are associated with

somatic distortion, chronic lameness, impaired proprioception, poor gait timing, predisposition to injury, delayed healing and pervasive physical and emotional stress.

Cause of ACP

Being domesticated causes the following problems for horses:

1. *Restricted exercise* – usually lacking appropriate ground surfaces and varied terrain.
2. *Dietary changes* – eating pre-cut forage and concentrates alters digestion and changes masticatory patterns, thus affecting TMJ function.
3. *Use of force by humans* – getting shanked, corrected, “rollkured” or pulling against cross-ties can damage the delicate muscles of the poll.
4. *Improper hoof trimming* – especially long toes.
5. *Inadequate dental care* – especially retention of malocclusions that restrict anterior-posterior jaw movement.

These human interventions result in damage to the upper cervical spine and musculature, leading to suboptimal function for stance and locomotion. The structural distortions in feet and teeth can distort the neural signals that inform the brain about the body's position in relation to gravity.

Surprisingly, horses spend much more time standing than they do moving. The average domestic horse is ridden for an hour a day, lies down briefly for REM sleep, but spends the rest of his time standing – typically, around 22 hours a day. Therefore, his stance can have a lot more influence on overall soundness than his exercise program.

Normal neutral posture

The standing posture observed in a normal, sound horse at rest is called normal neutral posture (NNP). Neutral stance balances and stabilizes the body's center of mass, allowing rapid, accurate mobilization when necessary. NNP is the functional output of sensory and gravitational information processed through the CNS¹ and is a prerequisite for wellness in all animals, including humans. The CNS regulates the activities of the mind and body as a complex system – an integrated, dynamic interaction of neurons, receptors, bones, muscles, connective tissue, and visceral functions.

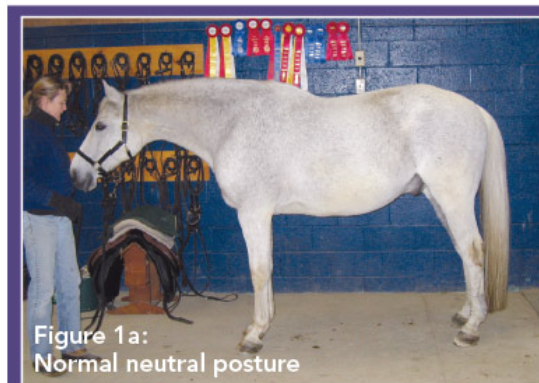
When standing on level ground, all four cannon bones (MC3) should be perpendicular to the ground, like a table (Figure 1a). Equine anatomy is adapted so that upright posture optimizes passive support mechanisms, making NNP metabolically economical to maintain. Limbs in this posture are positioned identically to maximize vertical loading during locomotion. Standing for long periods with perpendicular limbs best prepares the bones, muscles and ligaments for the higher forces experienced during high speed gaiting.

Mechanism of abnormal compensatory postures

ACP is generated by the postural control system² in response to flawed proprioceptive signaling from anatomic distortion, and misuse in regions rich in mechano-receptors: the upper cervical region, especially the small musculature; the occiput; C1-C2 and dural



attachments^{1,3}; the feet⁴; and the dentition and temporo-mandibular joints^{5,6}. ACP is also observed to be associated with impairment of emotional regulation, hyper-vigilant or dissociative behaviors, and presumed dominance of the sympathetic axis of the ANS. This ANS imbalance may be tied into long-term disruption of mind-body-emotion integration, parallel to that seen in human victims of illness, trauma, abuse and neglect⁷. Recent research has shown certain postures to be associated with specific behaviors in horses, and spinal pain to be associated with aggressiveness.⁸



When a horse is standing on level ground, all four cannon bones should be perpendicular to the ground, like a table. Equine anatomy is adapted so that this posture is the most energy efficient – any other posture takes more muscular energy to maintain, and puts strain on tendons and ligaments.



One of the most common causes of poor posture is imbalanced hooves, especially long toes. When toes are too long, the flexor tendons are taut and put pressure on the heels, resulting in the compensatory posture we call "goat-on-a-rock", where both front and hind legs are camped in. Chronic compensatory posture causes sore backs, hind limb lameness and heel pain (navicular syndrome).

Signs of ACP

Abnormal compensatory postures (Figure 1b) are commonly manifested with several of the following characteristics:

- Limbs (MC3, MT3) consistently non-perpendicular with respect to the ground
- Unwillingness to stand and bear weight on all four limbs simultaneously
- Unwillingness to stand symmetrically, with limbs aligned, i.e. a leg at each "corner"
- Chronic asymmetrical weight-bearing, as evidenced by disparate hoof size
- Aberrant or asymmetrical neck and head position, including eyes not held level
- Distorted or asymmetrical spinal contour
- Performance problems
- Chronic or recurrent lameness, with no known structural damage

Correcting the problem

How can we improve abnormal standing postures in horses? Many therapeutic modalities alter neural regulation to make changes in a patient's physiology, mechanics and emotion – these include osteopathy, [acupuncture](#), chiropractic and physical therapy as well as allopathic medicine. The Postural Rehabilitation Intervention (PRI), a manual therapy protocol developed by Dr. Judith M. Shoemaker, is similar to the Alexander Technique in humans and seeks to:

1. Lengthen the spine
2. Release compression and increase stability at critical transitional regions of the spine
3. Allow expansion and ease of use of the musculoskeletal system, making physical function, especially breathing, more balanced and effective⁶. Long term success also requires addressing and correcting distortions of hooves and dentition.

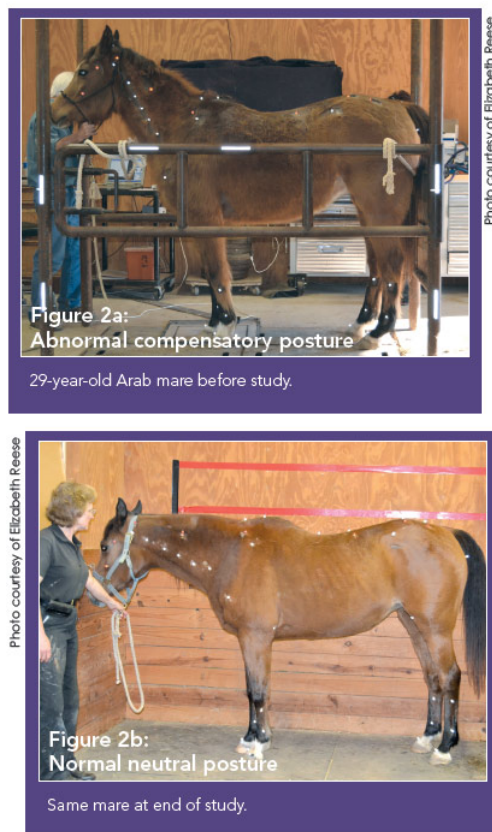
Study results show value of posture correction

The eight horses in the MHPR study were chosen because they exhibited one or more of the most common signs of ACP. They were sound, barefoot horses who stood in ACP on level ground and had hind frog width greater than or equal to fore frog width, suggesting their ACP was chronic enough to influence hoof morphology. When analyzing the data, every horse was found to have anterior-posterior movement restrictions in his/her dental occlusion, and distorted anterior to posterior proportions in weight-bearing surfaces (long toes). The horses underwent three clinical interventions over a ten week period, with five weeks between baseline, interim and final measurements. Extensive measurements were taken of their hooves, teeth and weight-bearing parameters³. The first intervention was a balanced hoof trim and accurate occlusal equilibration. Hooves were trimmed according to specific criteria at five-week intervals for the remainder of the study. The second and third interventions were applications of PRI manual therapy.

Analysis of these enormous data sets has just begun, but already some exciting results are emerging, confirming prior clinical observations:

1. The force plate recordings have confirmed our theoretical understanding that standing in ACP is more energetically costly than in NNP. When a horse's legs are camped in, to maintain this ACP, extra muscular effort is necessary to prevent collapse.
2. Application of PRI hoof trim principles resulted in rapid improvements in the front to rear frog width ratios.
3. Subjectively, spinal contours were observed to alter through the course of the experiment.
4. Subjective changes in behavior and emotion were observed by researchers.
5. ACP is commonly associated with long toes and A/P movement restrictions of dental occlusion. Whether they were caused by ACP, or are the result of ACP, would require a different study design.

Many challenges to our understanding were presented during this study. For instance, even though being sound and barefoot were inclusion criteria for the experimental cohort, every horse revealed significant foot pathology in their radiographs, despite feet that seemed superficially healthy. We also found that the handler holding the horse had enormous influence on the animal's posture, showing that recording "habitual posture" can be quite tricky in experimental circumstances. Our most elderly subject, a 29-year-old Arab mare with compromised dentition, poor condition and evidence of chronic laminitis (Figure 2a), looks 20 years younger after the study (Figure 2b).



Recognizing ACP in clinical practice is critical to restoring health and soundness in horses, especially while they're healing from injury. Even without training in specific PRI procedures, the veterinarian can help ameliorate these pervasive structural distortions with an accurate dental occlusal equilibration (OE); balancing the horse's weight-bearing surface around the center of articulation of the coffin joint; providing the most natural diet; and turn-out in an unrestricted area, with varied terrain. In addition, manual therapies such as chiropractic or osteopathic that promote the neutral, unrestricted movement of the upper cervical region (skull, C-1, C-2), can help the horse reset to his normal neutral posture.

For more on posture and performance, see our Facebook pages: "Postural Rehabilitation for Horses and Dogs", and "Maximum Horsepower Research". The Maximum Horsepower Research team includes Karen Gellman, DVM, PhD, Judith M. Shoemaker, DVM, Elizabeth Reese, MEd-LMHC, and Daisy Bicking of Daisy Haven Farms School of Integrative Podiatry.

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