Equine Asymmetrical Dexterity or, The Preferred Lead Syndrome

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Over the course of my career, it has been my observation that the prevalent and popular theories which tend to rule techniques of both riding and shoeing seem to be rooted in the belief that the horse is somehow intended by nature to be symmetrical.

Proper balance, according to currently popular definition, implies symmetry in both appearance and movement, nothing less. We are encouraged, for example, to think that things are at their best when front and hind feet have the appearance of matched pairs, when opposing diagonals maintain symmetrical stride lengths or when lead changes are smooth and equal - in other words, when ambidextrous behavior is exhibited. Typically, the closer a horse comes to displaying symmetrical movement; the more he is praised as being a "natural mover."

THE SYMMETRICAL THEORY

In view of the preceding, it seems safe to suggest that those who follow this line of thinking subscribe to what may be termed the "Symmetrical Theory." This theory, simply stated, claims that the "natural" horse is born symmetrical and would tend to stay symmetrical in both movement and appearance if not for accident or association with man. The implication is that the horse that displays asymmetrical tendencies is "unnatural" and that such a horse was born symmetrical, but somehow learned or otherwise acquired any asymmetrical tendencies that he displays.

ASYMMETRICAL INDICATIONS

Although symmetry of function and appearance in the horse may be desirable, it is seldom the case. It is the rare horse indeed that doesn't have a "stiff side" or a "favored lead." In the typical horse, for example, many distinctive signs of asymmetry may be easily observed, such as variances of size, shape or angle, which occur in the feet and legs. It is also evident that asymmetrical indications are not restricted to just the feet or legs alone. Certain left/right discrepancies have been noted when comparing various developmental and functional aspects of limbs, shoulders, withers, spine and neck, as well as an often-consistent reluctance to take a particular lead while being ridden.

NATURAL vs. UNNATURAL

While a great number of professionals in the horse industry may believe in, promote and expound upon the Symmetrical Theory in one way or another, clinical research simply does not support the supposition that symmetrical behavior of the horse is natural or that asymmetrical behavior is acquired. However, an abundance of evidence does exist which suggests a premise that is profoundly contradictory. Briefly stated, this premise proposes that the "natural" horse is born with certain innate tendencies, which result in naturally occurring asymmetrical movement and development. For now, this may be termed the "Asymmetrical Theory."

The following presentation of facts and information should serve to substantiate the premise as stated in the Asymmetrical Theory:

HANDEDNESS

Outwardly, humans as well as horses tend to appear symmetrical with respect to left and right, but function is not always symmetrical, especially during certain phases of movement. This is the result of handedness, an asymmetrical phenomenon of the brain. The most striking and most fundamental manifestation of external asymmetry, handedness, is directly linked to brain lateralization and is described as the "physical manifestation of brain laterality."

The "split" or "dual hemisphere" type of brain is a characteristic common to vertebrates. The left and right hemispheres interact and work together to handle the complex tasks of analyzing and organizing thought processes and directing physical activities and body functions. Laterality or Lateralization is the neuropsychological term used to describe the division of labor between the two brain halves of what is commonly referred to as the "split brain."

Although brain lateralization has been thought by some to be found only in humans or primates, as early as 1906 Sir Charles Sherrington, a pioneer in research of the brain and nervous system, demonstrated that animals with two brain halves (such as the horse) are capable of brain lateralization. In more recent research, Gnter Ehret, a zoologist at the University of Constance in West Germany, has concluded from studies of the mouse that animals are capable of brain lateralization and suggests that "...left hemisphere dominance has been around since the beginnings of mammals and isn't a specialty of man."

Handedness resulting from lateralization is most commonly exhibited in bipeds as right- or left-hand dominance. In the case of certain quadrupeds, such as the horse, the tendency is referred to as *sidedness* or *ipsilateral* (same side) limb dominance.

The tendency to be handed or sided can manifest itself in varying degrees ranging from ambidexterity on one end of the scale to extreme one sidedness on the other end. Studies show, however, that while tendencies in the extreme do occur, they are rare. The vast majority of animals observed seem to tend toward the average in the degree of sidedness exhibited; average in this case meaning generally falling within a mid-range between the extremes.

TRIPODAL SUPPORT

Before proceeding further with describing handedness or sidedness as it relates to the equine, it is first necessary to take a closer look at the overall way that a horse achieves balance. Of particular interest is something called tripodal support.

The horse belongs to a unique group of quadrupeds, as he possesses a rigid spine. The post and beam arrangement of his spine requires a remarkable set of balancing requirements to be utilized in regard to the arrangement and placement of the limbs during gait performance. In order for the horse to be properly balanced and supported during movement, alternating limbs must form a tripod of support around the center of gravity. This arrangement is achieved through a series of naturally occurring, yet remarkable reflex actions, which are carried out by the central nervous system. While it is true that three limbs are used to form the tripod of support, it is not always the same three limbs. Frequent lead changes tend to allow for all four limbs to be utilized in a constantly alternating manner, so as to reduce the risk of overloading. For example, the canter, according to O.R. Adams, is a "... three-beat gait in which two diagonal legs are paired. The single beat of the paired legs falls between successive beats of the two unpaired legs." The arrangement of limbs in a canter and gallop form a triangle or three-legged support. It is referred to by Milton Hildebrand as "...the tripodal support phase."

DIAGONAL ORIENTATION

Handedness or, in the case of the horse, sidedness (resulting from lateralization) and tripodal support are just two of several key factors needed to unlock and understand the mystery of innate asymmetrical behavior in the horse. The third factor is the inherent or naturally occurring diagonal orientation of the limbs that enables tripodal support.

In humans, the action of arms in opposition to legs or diagonal orientation occurs in all movements and is controlled at the reflex level. The same thing is true in horses, or any vertebrate's animal for that matter. Habitual movements that are reflexive in nature (inborn) are performed without direct commands from the brain. According to Dr. George Platt, "During the high-speed motion of the limbs, these characteristics are controlled by a motor program, or reflex action that is built into the animal at birth. There is no deliberate thought process going on while the horse is performing at speed. The gait comes from the spinal nerve centers." Without diagonal orientation of the limbs, tripodal support (discussed later) during gait performance could not take place. Diagonal pairs of limbs are linked together during locomotion by complex automatic reflexes originating from the autonomic system, which is located in the basal ganglia area of the brain. Carried out by action of the central nervous system, these innately programmed messages are responsible for maintaining diagonal orientation of the limbs during movement; hence, the use of paired diagonal limbs in left and right leads.

DIAGONAL ORIENTATION / HIND LIMB DOMINANCE

Power for locomotion, maneuvering and for gait performance, such as that which is required for engagement of leads and lead changes, is initiated by the hind limbs. The relationship between diagonal limbs, in particular the tendency for the hind to be dominant over the diagonal fore limb, has been established through various research studies. In one such study, for example, when electrical stimulus similar to that of the brain was supplied to the fore limbs of various animals, the response was a simple reaction by the stimulated limb. However, when stimulus was supplied to a hind limb, the response was always the same -- a remarkable reaction occurring in both the stimulated hind limb and its diagonal fore limb mate as well -- at the same time. These reactions -- which tend to mimic gait performance -- occurred despite the fact that communication between the spine and brain had been interrupted at the base of the cerebral cortex by surgically separating the two. In other studies it has been found that the effects of both the Shiff-Sherrington Syndrome and Wobblers Syndrome are demonstrative of the inherently complex relationship established between diagonal pairs of limbs at the reflex level.

The forgoing serves to introduce the fourth key element needed to gain better understanding of innate asymmetrical movement of the horse: dominance of the hind limb over its diagonal forelimb mate. Emphasis needs to be placed not only on the inseparable integrity with which diagonal limbs are linked but also the degree of dependence with which the fore limb relies on its diagonal hind mate for direction during gait performance. For example, stride length of the forelimb as well as angle of movement of the forelimb (relative to central axis) are determined by the diagonal hind.

THE DOMINANT DIAGONAL

The last and, perhaps the single most important factor to consider, (regarding left/right diagonals) is this: While each hind limb may be the controlling factor in the diagonal that it occupies, one hind limb is the more dominant of the two by virtue of the fact that it belongs to the ipsilaterally dominant side.

In free choice situations, it is the nature of a dominant limb to be used predominately. For example, during movement, it is the dominant hind limb that will influence which lead is used and how much time is spent in that lead. While at rest or grazing, the limbs of the dominant diagonal form a lead stance and are utilized for

support and balance more often and in different ways than the nondominant diagonal limbs. Quite often horses, regardless of age, will be seen to position one limb out in front of themselves while they are grazing. It is almost always the fore limb of the dominant diagonal pair which is stretched out in front and more often than not, will be the left fore, which indicates right rear left fore dominance stemming from right sidedness. Thus, the horse that favors a left lead is really right-handed (sided).

COMBINED EFFECTS: SIDEDNESS / DIAGONAL ORIENTATION / LIMB DEVELOPMENT

Forelimb movement is somewhat dependent on, in accordance with and proportionate (not equal) to the hind limb that it is diagonally linked to - especially while performing the trot. It seems safe to suggest, then, that forelimb development would be determined more by diagonal interplay than from independent action of the forelimb itself.

In order to illustrate the combined effects of sidedness and diagonal orientation, we'll enlist the aid of the ever-useful hypothetical horse. Our hypothetical subject will be a right sided (right-handed) horse, the right fore and right hind limbs being the ipsilaterally dominant pair. (As has been shown, this would be the result of the left motor cortex causing right side dominance, due to the lateralization process). The effect of sidedness in this case would be that superior strength and dexterity would develop diagonally, extending from the right hind to the left fore, not laterally to the right fore as might be expected. Diagonal development would occur in this manner because of innate diagonal limb orientation.

If the basic rule of "Form Follows Function" applies, one can easily see that one pair of diagonal limbs -- if they were being used differently from the opposing pair -- would tend to develop differently from the opposing diagonal pair, as well. Or, to put it another way: asymmetrical function of diagonals equals asymmetrical development of diagonals.

Developmental differences occurring in the opposing diagonals would include tissue and structural elements such as hooves, muscles and bones. As time goes on, developmental differences become more pronounced, revealing differences in appearance, strength and dexterity as well as differences of flexibility, range of motion, etc., occurring in the limbs and spine. Each diagonal pair of limbs will develop its own unique method of weight bearing and movement, each tending to be slightly different from the other. In essence, the horse develops skills of asymmetrical dexterity, such as a preferred lead. As he grows and matures, these skills change, adapt and become increasingly more confirmed, much in the same way that humans grow and adapt and become confirmed in their left or right-handedness.

PERSONAL RESEARCH

In my own research I have observed and studied over 500 horses. My preliminary findings show that:

a) Approximately 75% of the animals studied displayed a preference for the left lead, which would indicate a dominant diagonal consisting of the right hind/left fore (right sided.)
b) The number of animals that displayed extreme ambidextrous tendencies were 3. Fewer than 1%.
c) The number of animals showing sidedness tendencies to such a degree that one or more limbs were showing obvious but tolerable signs of stress from weight bearing imbalances were over 60%.
d) In most cases, efforts to minimize imbalance and weight-bearing stress were successful.
e) Methods used to bring about improved locomotive and weight-bearing balance included shoeing techniques, which considered natural asymmetrical tendencies, balanced riding techniques and therapeutic exercise.

CONCLUSION

From the outset, the purpose of this paper has been singular: to prove that asymmetrical tendencies in the horse are naturally occurring rather than acquired. Toward that end, it seems plain and simple that the horse fits all of the qualifying characteristics of innate asymmetrical behavior: i.e., lateralization, sidedness, tripodal support, diagonal orientation and hind limb dominance Hence, the preceding presentation of evidence and information should serve not only to support, but to prove the premise that asymmetrical behavior in the horse is the result of inborn attributes and comes to the horse naturally, arising from the combined effects of innate lateralization resulting in naturally occurring sidedness and diagonal orientation of limbs affected by inborn autonomic responses, as well as the demands of tripodal support. In short, asymmetrical tendencies of the horse are not the result of erudite or acquired behavior, but instead, are strictly the result of inherited tendencies.

EPILOGUE

The reader may at first question the value of this information. If so, then consider this: Farrier Science, as it is taught today, largely subscribes to and promotes (either loudly or indifferently) the Symmetrical Theory in both the teaching and practice of trimming and shoeing horses. In my opinion, a great deal of energy is being wasted by too many horseshoers today who seem to be too often engaged in a sincere and honest attempt at restoring to some mythical state of symmetry a horse that they mistakenly think has somehow acquired asymmetrical behavior. This is false and misguided thinking. The horse did not acquire asymmetrical behavior; the horse is born with it. It would be a classic exercise in futility to attempt to restore a horse to a state of being that never existed to start with.

The preponderance of evidence seems to weigh heavily in favor of the Asymmetrical Theory being correct. If that is the case, then the evidence profoundly implies that horseshoeing theory as it is taught today may be incorrect in its most fundamental of teachings regarding the source, cause and treatment of asymmetrical characteristics and behavior in the horse. That, in my opinion, is important enough to warrant serious consideration for change in both thinking and practice, as well as further research!

Author's Note: This article first appeared in January 1989 issue of *The American Farriers Journal*. Since then personal research has been ongoing, particularly in the area of how this information and knowledge can be utilized by farriers in their approach to shoeing horses. An updated article describing in greater detail the effects of asymmetrical behavior on the horse as well as practical shoeing applications which consider natural asymmetrical tendencies is in the works and forthcoming.

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