Left and Right: Positive and Negative

By: Britney Georgia

The brain is a complex machine that controls an organism from the simplest cell to the largest muscle. The brain has been divided and subdivided based on functionality and purpose. The simplest of those divisions in the brain are the left and right hemispheres. Each hemisphere is said to control the opposite side of the body. While it is difficult to specify which side processes certain pieces of information, there appears to be a favoring of sides among animals. This favorability or sidedness is expressed naturally; for example, humans express either right- or left-hand dominance as well as a few who are ambidextrous. Several aspects of each hemisphere have been explored to identify how to best handle a horse to bring about the most beneficial outcome; these aspects include lateralization, sensory processing, and learning with the least amount of stress and anxiety in the horse.

To begin, it is important to understand the natural tendencies of a horse, to discover the best way to approach the horse, the best ways to train, and the best way to habituate a horse. Horses are animals that have always been preyed on and their main response in a stressful situation is flight over fight. With horses being large animals, it is difficult to grasp what animal could hunt a feral horse. Typically, wolves, bears, and cougars are the predators that horses are avoiding or running from, which is why horses are great with speed in their legs (Williams). Horses then, by nature, are very responsive and reactive to things that spook them; this flightiness can be considered a "bad behavior" by those who deal with horses day-in and day-out (Williams). This by no means is a deterrent for many people who love their horses and want to put in the hard work it takes to earn a horse's trust and to train him to the best of their ability. The common idea is that you must train a horse and habituate a horse, even from a young age, on both sides of its body as if you were training two separate horses, one right after the other. As a training tip from Clinton Anderson's Downunder website simply puts it, "Horses have two sides to their brains: the left brain and the right brain. Each side of your horse's brain is like a separate horse. You've got Lefty and you've got Righty. Horses hear, smell, think, and react differently on each side of their brain" (Training). In training, when trying to desensitize a horse, one must make the horse desensitized on both sides. A horse will not generally understand that same learned principle when the trainer changes positions and sides (Training). Similarly, when compared with humans, a horse can favor, or use, one side—left or right—of its body more than the other (Williams).

Because of how the horse must be taught twice, there is a debate about whether the dominance of one side of the body over the other is linked to the overall personality of the horse depending on which side is more dominant and thus which part of the brain is more active. This includes what the horse does when trying to look at an object visually and the overall personality of the horse. Many studies have been performed to test the idea that horses will favor one side of the body and thus the opposite side of the brain. In one such study, horses were observed to mostly favor their left side and thus favoring the right hemisphere of the brain. This left-side bias

was observed among different horses as stated in the study's report: "We found no evidence that this left bias is affected in direction or strength by age, rank, sociability, phenotype, or sex" (Farmer et al.). As this study deduced, one-half of the brain may specialize in responding to situations better or more frequently than the other, thus creating horses that have stronger tendencies in certain situations and revealing an equivalence between personality and naturally developed reaction responses. This selectivity of dominance and brain development in personality is also linked in the study to the horse's emotions during training or during social interactions in which positive and negative emotions are experienced and processed better on the horse's favored side versus the other (Farmer et al.).

The study that brought forth the idea that each hemisphere is specialized to respond with one emotion and uses that one emotion when presented with an associated stimulus to process that stimulus. These were separated based on positive and negative emotions, as was the first study discussed, and linked to avoidance and approach behaviors in a horse when presented with a stimulus (Larose et al.). One famous company that helped to popularize the idea of horse learning being linked with brain dominance and personality was Horsenality. Online, the company developed and presented a way to "… quickly identify your horse's innate characteristics and introduce specific strategies for bringing out the best in your horse" (Patricia et al.). This idea was created in an easy-to-understand way to help common trainers develop a better approach to training their horses based on personality types and characteristics, including introvert and extrovert when put in combination with being either left-brained or right-brained (Patricia et al.). A new and growing approach to this idea, instead of utilizing competing studies and theories, is evidence-based horsemanship. On the website for the fresh approach to training and habituation, it explains that "Evidence-Based Horsemanship combines science and the understanding of brain function with an empirical understanding of the subtleties of a horse's behaviors, reactions, and chemical states" (Based Horsemanship). The creator of this approach in horsemanship wanted a better explanation than "train a horse on both sides"; thus, he used neuropsychology in a medical/evidence-based approach to understand the best way to train and habituate a horse without needing to know the horse's personality type (Based Horsemanship). By studying the interactions and methods that horses use naturally between each other, humans could integrate horse behaviors into their training methods based on social interactions as evidence of learning.

Horses are very social creatures with a strong sense of herd mentality, and social interactions are frequent and common between horses. In the "Basics of Equine Behavior," Williams explains, "The body language of a horse is unique to the equine species. As a highly social animal, the horse communicates its emotions and intents to its herd mates through both vocalization and body language. A person handling horses needs to be able to read the horse's body language to be an effective trainer" (Williams). Horses interact in a series of different ways, which can be influenced by many factors among members. One study on horse sensory laterality in affiliative interactions recorded a total of 2,475 social interactions among 31 horses and ponies through the course of the study (Farmer et al.). The study organized the types of

interactions and came to notice that horses, since it is easy to distinguish which eye is being favored during any social interaction because their eyes are on either side of their heads, showed a bias toward the left side in interactions during a binomial test, which was a finding made independent of "...age, sex, rank, social index, phenotype, and group composition" (Farmer et al.). This is comparable to when two people meet and go to shake hands; they almost always stick out the right hand to shake. This observed interaction of horses lends toward the understanding of equine behavior when connected with the biases of the brain. As best explained in the study, "… if horses have a preferred side for social interaction, this could be an indication of how training and handling can be carried out most effectively and safely" (Farmer et al.). Social interactions are only on the surface of observation and understanding of how horses can learn.

Sensory processing and lateralization are important for a horse's learning from birth. While lateralization is developed over time in combination with sensory processing in the brain, "… newborn foals are neurologically mature at birth. They are most vulnerable immediately after birth so they must be able to identify danger and flee if necessary" (Williams). This maturity includes all senses and motor movement capacities, which is why a foal stands and starts exploring the world within hours of birth. The horse has been studied for its reactivity in a multitude of situations—both stressful and excitable—which is distinguished between a favored side and an unfavored side when interacting with one another. In most instances, it is the horse's eyes that are studied in order to note which eye the horse will use to see something new, old, good, or bad in affiliation. A horse relies mainly on its eyes to perceive the world around it (Williams). As previously discussed in the study by Farmer et al., there was a considerable preference among horses to approach from the left side in horse interactions. This meant that horses were further left-lateralized, or that an experience could be associated as positive or negative and processed on a specific side of the brain. That might not be an accurate conclusion if, in most cases, a horse will favor its left side consistently. By using this knowledge as an advantage, it may be more beneficial in reducing stress in horses during training to approach horses in a similar manner (Farmer et al.).

In another study of breed differences in emotionality and object approaches made by horses, horses with higher emotions (Trotters) would look more at a stimulus with its left eye while a calmer horse (French Saddlebreds) would tend to use its right eye to look at a stimulus (Larose et al.). It is possible that this preference of sides is based on emotionality, breed, genetics, or training experience by humans to cause the dominance of one side over the other (Larose et al.). This can be like humans training left-hand dominant people to write with their right hand. The study continued by concluding that horses then favored the right hemisphere of their brain with more emotionality present in that dominance (Larose et al.). Laterality bias can be easily determined through a horse's motor dominance in "relaxed forelimb position, initial forelimb use, and task-related forelimb position," which can lead to understanding the cognitive bias in the horse (Marr et al.). Using this bias, one can predict how a horse will react in stressful situations and what emotional tendencies they might display, thus leading to a more appropriate

approach to training a horse (Marr et al.). In the study, horses learned to discriminate between positive and negative objects, and then they were presented with novel objects to investigate freely. The study observed how the horses in the experiment reacted as they investigated. They used this discrimination to see if horses would then approach the ambiguous new objects with a similar approach as the positive or negatively distinguished objects (Marr et al.). The link that was found insisted that "[a] preference for the use of the right forelimb when moving off from a standing position (initial forelimb use) indicates an optimistic manner/positive cognitive bias in horses in specific context and object investigation…" (Marr et al.).

Reinforcement in learning, negative or positive, can be taken into consideration when training horses. It has been debated which style of training is more beneficial, and it has been tested. As horses discriminate between stimuli according to personality and emotionality, they respond to different learning techniques in a similar way with better performance in one style versus another. In one study where stressors were presented during training, the style of training was tested for horse performance and learning based on personalities (Valenchon et al.). As explained in the study, "… we first assessed whether learning performance varies with the presence or absence of stressors unrelated to the task in horses performing an instrumental task based on positive or negative reinforcement" (Valenchon et al.). They used cortisol concentration in the horses' saliva to test the amount of stress that was experienced before and after they trained under different styles and conditions for the experiment (Valenchon et al.). There was a loose connection "between personality and learning performance" concluded by the study with stressors having a considerable impact on learning ability: "In the absence of stressors unrelated to the task, the most fearful horses appear to be the best performers with negative reinforcement learning (NR group) but the worst when they had to learn with positive reinforcement learning (PR group)" (Valenchon et al.). In some cases, horses should be fearful to keep them at a constant ready for the next thing, but only in cases of negative reinforcement (Valenchon et al.). By understanding how stress affects a horse's learning under the right kind of reinforcement learning based on personality, a trainer can know exactly what style would be most beneficial and help to ensure there are no outside interferences (Valenchon et al.).

In conclusion, the world is moving towards a better understanding of horses and how they are best handled in various situations. The use of tested personalities helps to create a highly successful approach to training horses. It all comes down to the science and experience of the horse and the horse's brain. The control that the brain exerts on the body influences personality, side dominance, and functionality. There are many conflicting theories about how the brain is specialized for processing emotions and different stimuli, and this makes the naturally expressed dominance of a horse harder to predict beyond a relaxed environment. This knowledge can be used to avoid stressful situations with a horse and gives a deeper understanding of the social interactions experienced between horses and man. By observing sensory processing and lateralization, the cognitive bias of horses can be drawn and used as a guide for horse handling and learning.

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Works Cited

"Based Horsemanship: About." *Evidence*, www.evidence-basedhorsemanship.com/about.php.

Farmer, Kate, et al. "Sensory Laterality in Affiliative Interactions in Domestic Horses and Ponies (Equus Caballus)." *Animal Cognition*, Springer Berlin Heidelberg, Sept. 2018, www.ncbi.nlm.nih.gov/pmc/articles/PMC6097077/.

Larose, Claire, et al. "Laterality of Horses Associated with Emotionality in Novel Situations." *Laterality: Asymmetries of Body, Brain and Cognition*, vol. 11, no. 4, 2006, pp. 355–367., doi:10.1080/13576500600624221.

Marr, Isabell, et al. "Evidence for Right-Sided Horses Being More Optimistic than Left-Sided Horses." *Animals*, vol. 8, no. 12, 2018, p. 219., doi:10.3390/ani8120219.

Patricia, Roxy, et al. "Horsenality." *Parelli Horse Training*, www.parelli.com/horsenality/.

"Training Tip: Train Both Sides of the Horse." *Downunder ICal*, 28 June 2016, downunderhorsemanship.com/2016/06/28/training-tip-train-both-sides-of-the-horse/.

Valenchon, Mathilde, et al. "Stress Affects Instrumental Learning Based on Positive or Negative Reinforcement in Interaction with Personality in Domestic Horses." *Plos One*, vol. 12, no. 5, May 2017, doi:10.1371/journal.pone.0170783.

Williams, Carey A. "The Basics of Equine Behavior." *Equine Science Center*, 22 July 2004, esc.rutgers.edu/fact_sheet/the-basics-of-equine-behavior/.