LATERALIZATION IN FERAL, PRZEWALSKI AND DOMESTIC HORSES

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ABSTRACT

Lateralization, referring to differential processing of information by the left and right sides of the brain and to side biases in behaviour, has been reported in domestic horses. To determine whether lateralization is characteristic of the horse (*Equus caballus*) as a species and not simply a result of training or domestication, field studies were carried out observing Przewalski horses (*Equus ferus przewalski*) and two groups of feral horses that differed in number of generations removed from domestication. Przewalski horses are the closest wild relative of domestic horses. Left-side biases of approximately 57–68% were found in agonistic interactions, 63–73% in high alert and 53–54% in vigilance. As in other vertebrates, the right hemisphere of the horse is specialised to control agonistic interactions and responses to potential threats. Also consistent with previous research, showing right-hemisphere control of the expression of strong emotion, leftwards bias was stronger in measures of behaviour involving higher aggression and reactivity. Domestic riding horses were also studied using the same methodology and found to display left-side biases for the above measures, with the exception of vigilance, but the strength was weaker than in feral and Przewalski horses. This suggests (a) ancestral horses were more strongly lateralized for attack, vigilance and reactivity than are present-day domestic horses, and/or (b) lateralization is stronger in horses living in natural habitats. Limb preference, measured as the forelimb placed in front of the other during grazing, was investigated because previous research has shown limb preference in some breeds of domestic horse. No population bias of forelimb preference was found in feral or Przewalski horses or in most of the domestic horses studied, except Arab horses, which preferred to use the left forelimb as weight support during grazing (61%). This may reflect the flighty temperament of Arab horses since it suggests right-hemisphere dominance. Stronger left-supporting limb preference was associated with increasing reactivity in feral horses. Stronger individual limb preferences were found in younger feral horses than in adult feral horses, indicating limb preference is modified by maturation or experience in the natural habitat. Side biases in threat, vigilance and reactivity are, apparently, also modified, by experience in the natural habitat or domestic environment, whereas side bias in attack is not. Domestic horses that had been ridden showed stronger biases in threat and reactivity than those that had never been ridden. The implications of these findings in regards to welfare are discussed.

CERTIFICATION

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing thesis and all sources used have been acknowledged in this thesis.

Signature 

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All photographic images were taken by the researcher while conducting fieldwork and used with permission of the owners or those responsible for management of the horses. Copyright was obtained from the appropriate authorities to adapt the topographical maps for use in this thesis (details are given under the maps).

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GLOSSARY OF TERMS USED

Index of laterality: (Right scores – Left scores) / **(**Right scores + Left scores).

Laterality of vigilance: the number of times a horse stopped grazing and lifted and turned its head to the left and to the right. All head lifts, regardless of height of the lift, were included in this measure. These scores were used to calculate a laterality index (LI-vigilance).

Laterality of high alert: The number of times a horse stopped grazing and lifted its head to a height at which the poll was above the level of the withers when turning to the left or to the right. Note that this measure included only high head lifts because these are known to show elevated heart rate and activation of the sympathetic nervous system. A laterality index (LI-high alert) was calculated from these scores.

Percentage reactivity: The number of times a horse lifted its head with the poll above the level of the withers divided by the total number of times it lifted head to any height to look either to the left or to the right. If a horse lifted its head and looked leftwards 10 times and of these lifts five were above the level of the withers then percentage reactivity for left head turns would be 50%. A similar score was calculated for looks to the right. Percentage reactivity for left and right head turns was compared.

Level of reactivity: The number of times per hour that a horse stopped grazing and looked up, including left and right head turns as well as head lifts without turning of the head.

Looking bout: The period during which a horse fixated the head region of a conspecific using the left or right eye. This was scored only during agonistic interactions (threats or attacks).

Threat bout: A looking bout containing only low level threat responses (e.g. head threats, tail swishing, hindquarter movement, leg lifting). Often referred to simply as a threat.

Attack bout: A looking bout containing at least one high level threat response or attack (e.g. bite, kick, strike, rearing with contact or boxing, lunge, charge and chase). Often referred to simply as attack.

Laterality of threat: The number of threat bouts in which a horse fixated a conspecific with its left eye or with its right eye. A laterality index was calculated.

Laterality of attack: The number of attack bouts in which a horse fixated a conspecific with its left eye or with its right eye. A laterality index was calculated.

Level of aggression: The number of times per hour a horse engaged in an agonistic interaction (threat or attack).

Limb preference: The forelimb placed in front of the other during grazing measured using 30-second-interval sampling. Limb preference was calculated as a laterality index.

CONFERENCE PRESENTATIONS DURING CANDIDATURE

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