

## Review

Relevance of brain and behavioural lateralization to animal welfare ☆

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## Abstract

The left and right sides of the brain are specialised to process information in different ways and to control different categories of behaviour. Research on a range of species has shown that the left hemisphere controls well-established patterns of behaviour performed in non-stressful situations, whereas the right hemisphere responds to unexpected stimuli and controls escape and other emergency responses. The known functions of each hemisphere are summarised in this paper. Then it is hypothesised that stressed animals rely on predominant use of the right hemisphere, and that a bias to use the right or left hemisphere, respectively, may explain the behavioural differences between animals with a negative cognitive bias and those with a positive cognitive bias. In some species of primates it has been shown that the preferred limb used to pick up food when the animal is in a relaxed state reflects the dominant hemisphere and may be an accessible measure indicating susceptibility to stress and tendency towards positive versus negative cognitive bias. Hence, limb preference might be a useful measure of such tendencies in domesticated species. Some difficulties in determining a relevant measure of limb preference in non-primate species are mentioned, followed by the suggestion that eye preferences for viewing certain stimuli may be a useful measure in species with laterally placed eyes. Finally, effects of experience on the development of hemispheric dominance are discussed, leading to a suggestion that the welfare of domestic animals may be enhanced by ensuring development of left hemisphere dominance (e.g. by exposing chick embryos to light) and by shifting right to left hemisphere dominance in animals with negative cognitive bias.

**Keywords:** Hemispheric specialization; Cognitive bias; Stress; Limb preference; Experience; Development

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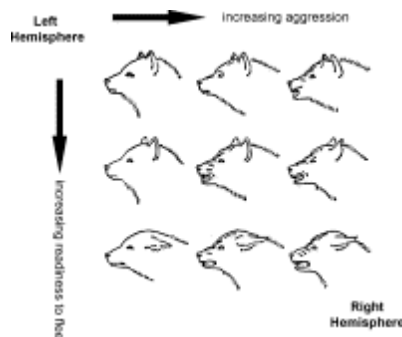


Fig. 1. An illustration of the facial displays of the dogs adapted from Figure 26 of [Lorenz \(1981\)](#) to show the separate and superimposed emotions of fear and aggression, both controlled by the right hemisphere. The left hemisphere has complete control in the neutral expression at the top, left-hand corner of the array. The right hemisphere is in complete control in the facial display shown in the bottom, right-hand corner. The other expressions of the array indicate various degrees of dominance of one or the other hemisphere. Increasing right hemisphere control occurs with increasing readiness to flee and with increasing aggression. The dog illustrated in the bottom right hand corner has high aggression and high readiness to flee: if cornered, it is likely to attack.

Table 1.

Complementary specializations of the hemispheres.



Review based on David Wood-Gush Memorial Lecture presented at the ISAE conference in Cairns, Australia, July 2009.