# Abstract - Cathrynne Henshall

## Brain train your horse - applying neuroscience to improve horse training and welfare

Research in cognitive and affective neuroscience has transformed our understanding of learning and emotion in animals and humans. The application of this knowledge to horse training could deliver many benefits to horses and their owners, as equine emotions and learning abilities rely on similar neural processes as other species. There are few available techniques to directly probe equine brain function, so the translation of these findings to horses is necessarily inferential; however, validated methodologies bridging this gap in human research can be applied to horses. Areas within neuroscience research with particular relevance for horse training and management include: how the brain processes the kinds of aversive stimuli commonly used in horse training; the effects of stress neurophysiology on learning; the interactions between new learning versus habit learning - an issue for retraining unwanted behaviour; and the prediction error concept - a dopamine influenced neural “teaching signal” that assists animals to make decisions that deliver the best outcomes for them. In human-horse interactions, behaviour provides the interface between neural activity and horses’ responses to training and environmental stimuli. Providing owners with a greater understanding, even at a simplified level, of the putative neural processes underpinning behaviour could assist them to improve their practices. For example, a knowledge of the workings of the habit and flexible learning neural networks and prediction errors could assist trainers to identify why horses may fail to learn a new habit or why they persist with unwanted behaviour despite extensive retraining. Alternatively, a knowledge of the effects of stress physiology could assist trainers to modify their practices to manage stress and enhance learning. The addition of neuroscience to inform horse training and management techniques could provide a mechanism to develop truly horse-centred training approaches that could improve welfare outcomes for horses and enhance human safety.

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